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The Allis Engines at Glasgow.

In our issue No. 29 we gave some facts regarding the early difficulties with these engines due to starting them up under load without first breaking them in, because of the needs of the Exposition at Glasgow.

At the present writing these engines have been in regular service over sixty days and the engineer who erected them reports in a recent letter to his home office that they are the two best engines that ever left the Allis shops and that he never saw more quietly running or satisfactory machines. As to the English and Scotch engines, he writes:

"One of the Stewart engines is all adrift and they have been for about four weeks trying to remedy matters, but by all appearances I think they have struck a snag. The first Musgrave engine has been running for the last four weeks and cannot be put to work yet as it will not regulate. There is not a word in any paper about either the Musgrave or Stewart engines, but if this had been the American engines it would have been published in all the papers in Great Britain. But there is no paper talk now; the show is fast changing."

It will be recalled that our previous article stated that one of the Stewart engines had been "handed over to the Stewart company for overhauling" and that the second one would be as soon as the first one was in working order, this action being taken because the engines would not work with the governor. The letter of the Allis-Chalmers Company's engineer would indicate that the results of the overhauling have not been happy.

Since the above was put in type we have received a copy of a letter by the Allis works engineer—Mr. McGregor—dated July 30, which gives later information. Following is an extract from this letter:

"The engines are still running fine, and our 60-day run was up on the 25th of the month, without even a single stop. I tell you the Stars and Stripes are still on top, and I get congratulated almost daily with the above remark. Our English friends, the Musgraves, had five full weeks to break in their first engine, and last Sunday they went on the load and stayed with it for just eight hours, then had to shut down with hot bearings and guides. On Monday morning they had to lift their main shaft and move one of the lower shells. They have been about 5½ months erecting this one engine, and no paper talk about it either. Our two engines are fast getting to be the favorites in the station."

The "Practical Engineer," of London, has been especially bitter regarding these engines and has published many misstatements about them. One of the latest of these is that an expert was sent from Milwaukee to Glasgow to investigate the troubles. We are informed by the Allis-Chalmers Company that this is untrue and that "no one was sent from this country to handle the Glasgow engines, except the men who went with them on the start. In brief, the only ground the papers have had for adverse comment has been occasioned by our efforts to accommodate the Glasgow authorities by starting the engines in work before having a chance to thoroughly try them."

We do not wish our publication of these facts to be understood as an attack upon the British engines. It is not to be supposed that the Musgraves or Stewarts are not competent engine builders, although it is quite possible that in electric power house engines they have come across some problems that are new to them. We should very much like to know their own explanation of the situation. We shall, however, watch the columns of the "Practical Engineer" with some interest to see how it extricates itself from the hole into which it jumped when it assumed the trifling difficulties experienced at the start with the Allis engines to prove those engines to be hopelessly bad. In view of that paper's "militantly British" state of mind, its moves will be doubly interesting.

Chas. Francis Adams' Remedy for Strikes.

Elsewhere in this issue we publish a letter written by Charles Francis Adams about a method of settling labor difficulties. Any proposition touching upon a matter of public interest made by one who is so well known as a broad-minded and intellectually trained man is certainly worthy of careful consideration, and just at this time when strikes are receiving so much attention his letter will be read with special interest. It is to be noted that such a commission as Mr. Adams favors would be likely to do what is not now done at all—that is, to put the public in possession of all the facts concerning an industrial difficulty. This is not now done, though there is a pretense of doing it by the newspapers, which, however, with few exceptions misrepresent one side or the other, according to the prejudices of the editors or owners.

The case cited by Mr. Adams was one which stopped the operation of a railroad and in all such difficulties when an important public function is interfered with, the public has a greater and more direct interest than it has in such a case as the steel strike or the machinists' strike and its influence is more apt to be directly felt, but in any case it is probable that no strike or lockout could continue very long after general public sentiment had settled to a firm conviction regarding the right and wrong of a given case. And such a crystallization of public sentiment would inevitably take place and usually in favor of the right side whenever the facts were authoritatively given and both sides fairly presented.

The Brooklyn Bridge Accident.

"Engineering News" for August 8 contains a letter on the recent breaking of the suspender rods of the Brooklyn Bridge by Mr. Wilhelm Hildenbrand which is highly reassuring. Mr. Hildenbrand was Mr. Roebling's assistant and made the plans and calculations of the whole superstructure and is therefore entitled to speak with authority. While he considers the closing of the bridge to have been wise as a measure of prudence he does not consider that the bridge was in the slightest danger.

The construction of the stiffening trusses and the floor beams is such as to transfer the weight to other suspenders in case some

should break and because of this he declares that "every suspender of the outer cables might break for a distance of 250 to 300 feet without doing any appreciable damage to the bridge."

He considers that "the direct cause of the breaking of the rods cannot be told with absolute exactness," but does not believe that the rods broke in succession like the ripping of a seam, because of the transfer of load, to be more than partly true. If this were the real action he pertinently says: "There is no reason why the breakage should have stopped after nine rods were broken." The original factor of safety of these rods was eight and is now not less than six.

Taking up the much condemned hinge construction of the short suspender rods he says that while it "answered all purposes under normal conditions there is reason to suppose that the latter have been disturbed in course of time." As the temperature changes these rods play between the floor beams, and while these beams are far enough apart to accomodate the movement when the parts are properly located it appears that the original location of the parts has not been preserved. The upper ends of the suspender rods are attached to bands which clasp the cables and "occasionally the cable bands did not offer sufficient resistance and shifted on the cable or were intentionally shifted to accommodate the direction of the suspender rods," so that "it is probable to assume that the rods which broke, in place of 3½ inches [as calculated] may have swung 7 or 8 inches out of plumb." Not only did this increase the temperature stresses five or six times, but "there was not sufficient room between the top chord channels for so much motion. The suspender would bear against the edge of the channel and would bend." The lateral vibrations of the bridge also lead to "constantly reversed bending strains in the rods as soon as they are rusted in the hole of the trunnion block." Mr. Hildenbrand gives as his opinion that "it is probable that a combination of all the circumstances mentioned must have happened which easily could have produced sufficient tension in the rods to break them." After recommending the strengthening of the bottom chords of the stiffening trusses within the stay system and a modification of the short suspender rod arrangement, Mr. Hildenbrand concludes by saying:

"While the Brooklyn Bridge has a few points in some details which should be improved, it has plenty of strength in the cables, which are the true backbone of the bridge. Under the supposition that the structure is in perfect state of preservation, it is capable of accommodating safely all the traffic it bears now without restricting the trolley cars to run at specified intervals and without giving occasion for apprehending danger or alarming the public at every slight mishap that may occur."

It will be seen that this presentation of the case does not release the bridge authorities from the charge of neglect, but quite the contrary. The displacing of the cable bands, if accidental, could not have happened without discovery, had there been any inspection of the bridge worthy of the name, and the displacement could not have been purposely made except through the grossest ignorance. While the letter studiously avoids casting any reflection upon anyone, it is, as a matter of fact, the most severe, because the most capable and authoritative, condemnation of the trustees of the bridge that we have seen.

Gus. C. Henning, who when the bridge was built acted as assistant to Mr. Hildenbrand and who happens to have designed the suspenders some of which have broken, adds his testimony to their security and concludes his letter by saying:

"In order that the same device may operate satisfactorily during the life of the bridge it is only necessary to:

"(1) Clamp the cable bands tightly and keep them in proper position, instead of permitting occasional unnecessary shifting.

"(2) Lubricate all moving parts under all atmospheric conditions.

"(3) Apply sufficient paint whenever necessary to prevent corrosion."

This is very simple, and it would seem as though it would be a very easy matter to secure the observance of such elementary rules.

The Holley Memorial.

The New York "Times" devotes an editorial to the unfortunate location and the present neglected condition of the engineer's memorial of A. L. Holley in this city. It says, in part:

"On a side path in Washington Square, facing a vulgarly ornate frame cottage which has some purpose in connection with the administration of the park and the storage of lawn mowers, rakes, wheelbarrows and the like, stands the beautiful memorial bust of Alexander Lyman Holley on a pedestal of unusual excellence. In a modest way it is one of the most charming and attractive of the monuments of New York. The memorial is in every way worthy of the rare man whose memory it was designed to perpetuate as a stimulus to the young engineers of succeeding generations to strive for the attainment of high ideals in professional life. To those who see it without a special search to locate it, this beautiful memorial is absolutely without interest or significance. It is not well cared for. The pedestal is marred and begrimed and it gives every evidence of neglect. The eyes, ears and corners of the mouth are occupied by the white cocoons of the caterpillars from the surrounding trees, giving it a grotesque appearance calculated to excite the passer-by to laughter. But even if properly cared for it is without meaning or significance where it is.

"We advise that steps be taken to correct the mistake of its location. The proper place for the Holley Memorial is in the grounds of Columbia University, perhaps in front of the beautiful library building, where it would in the highest degree serve the purpose of its creation and be appreciated for what it is. Permanence can be better assured if it is committed to the care of the trustees of a great educational foundation than if left to the tender mercies of those chosen by successive political administrations of the city to manage the parks."

The words of the "Times" are timely. The suggestion of location suggests only one better place for it, which of course would be in front of an engineer's building which all the great engineering societies should, and may yet, unite in erecting. If a posibility of this is in sight the memorial may as well be allowed to remain where it is for the present.

The Settlement of Strikes—How Public Opinion May Be Appealed to Through Official Proceedings.

As it is always the case when some pitched battle between consolidated capital and organized labor is plainly impending, much is now being written and said on the subject of arbitration—or "compulsory arbitration," whatever that may be—as a means of putting a stop to these conflicts, or at least of mitigating the injury and inconvenience they occasion. As between the employer and the employed it is, of course, a matter of secondary consideration. Were no one else concerned, they might safely be left to face, as best they might, the results of a trial of endurance. Unfortunately, in these days of well-nigh unlimited consolidation on the one side and almost complete organization on the other, the general public—the community at large—necessarily sustains prejudice. It is, also, defenceless—without apparent power to intervene for its own protection.

As to what is known as "compulsory arbitration," no practical method of causing the award of any tribunal to be respected and obeyed has yet been devised, and it is difficult to see how one can be devised. It is obviously impossible by any provision of law or decree of equity to compel a man to carry on a business which he is not willing to carry on; and, on the other hand, it is equally impossible to force any employee to labor, if he prefers to be idle. Even "government by injunction" will not go that length.

My object is to call attention at this juncture to the nearest approach to a practical solution of this problem which, so far as my observation goes, has yet been devised and put in use. In the State of Massachusetts there is, and for thirty years has been, a Board of Railroad Commissioners. In the history of that Board there is one important but now forgotten experience from which a highly suggestive lesson can be drawn. It occurred nearly twenty-five

years ago; and, now that the United States Steel Trust and the Amalgamated Association are at issue, it might be well worth while to revive a recollection of that experience. The Massachusetts Railroad Commission was organized in 1869 on the theory that, in adjusting matters of difference between the community and its railroad corporations, arbitrary power was, in the long run, less effective in producing results than investigation and subsequent well-considered recommendations based thereon. In the event of differences between corporations and their employees, even when resulting in strikes and "tie-ups," the Commissioners had no special powers. It was merely their duty in a general way to take official cognizance of the fact that the community was sustaining an injury or an inconvenience, and to investigate the cause thereof. Having so investigated, the Board was empowered to locate the responsibility for such injury or inconvenience, and make its recommendations accordingly. But those recommendations had a moral force merely. They could be addressed to the parties concerned and to public opinion only. Their effect, greater or less, was measured by the justice and good sense impressed upon them.

At four o'clock P. M. of the 12th of February, 1877, all the locomotive engineers and firemen in the employ of the Boston & Maine Railroad Company stopped work in a body, abandoning their trains. The strike was not altogether unexpected; but, of necessity, the operation of the road was seriously interfered with. The Commissioners did not at first intervene, neither party calling upon them. Both were, indeed, unwilling so to do, being apprehensive, apparently, of some action adverse to their interests. When several days of interrupted traffic had elapsed, the Board concluded that it was time to recognize the fact that the public was suffering inconvenience; for the Boston & Maine Railroad then was, as it now is, one of the principal arteries of Eastern New England. Both the directors of the company and the employees of the Brotherhood of Locomotive Engineers were accordingly notified that the Board proposed to take a hand in the matter, which it at once proceeded to do, notifying an investigation. Both parties appeared—without confessing itself in the wrong, neither could well help so doing—and professed willingness to submit their cases. No suggestion of a readiness to abide by a decision thereon was asked for or given. The Board then proceeded to hear witnesses and to ascertain the facts. The inquiry was continued through three days, and on the 21st of February the report of the Board was made public, appearing in full in all the papers. In it the Board, after carefully and judicially stating the facts of the case, placed the responsibility for the trouble where the weight of evidence showed it belonged, and made such recommendations as in its judgment the occasion called for. The effect was immediate. An authentic record was before the community, and public opinion, crystallizing at once, made itself felt.

Into the history and merits of that particular struggle it is unnecessary to enter. The present object is merely to call attention to what was then done, and done successfully, as constituting the nearest practical approach possible to what is called "compulsory" arbitration. A public board is provided; that board takes cognizance of what is notorious, and when either the peace or the business of the community sustains prejudice, or is gravely jeopardized, it becomes its duty to intervene officially. It then spreads the facts before the community and makes its recommendation. There it stops; for it can compel obedience on neither side. Setting forth the facts, its appeal is to an enlightened public opinion. So stimulated, public opinion rarely fails to make itself felt. It did so in the case referred to. The atmosphere cleared at once, and no further action was found necessary. Were such a machinery as this in existence, either national, or provided by the State of Pennsylvania—were the Executive empowered *pro hac vice* to appoint such a board—it would seem more than probable that a practical solution of the difficulty now impending could easily be reached. The community has already sustained grave prejudice. By a continuance of the existing conditions, not only must private interests be sacrificed, but the public peace will be endangered. It is not probable that either party would call upon such a board to intervene. Both would look at it askance. It would rest in its discretion, or that of the Executive, to decide whether the case was one which justified a public initiative. Should it be decided that the circumstances did call for it, the board would give notice to all concerned that, at the proper time and place, it proposed to enter upon an investigation. If both, or either, of the parties saw fit then to appear and submit the facts, those facts would become public property. Did one party appear, the other would absent itself at its peril. Should neither party appear, producing authentic documents and putting in a case, the board would proceed to enlighten itself through all other accessible means. If unable to summon witnesses or enforce the production of documents, it would still have open many secondary channels of information. To all such it would have recourse. Having done so, it would make its report, putting the responsibility where the facts accessible showed it belonged, and recommending such practical solution of the trouble as might commend itself to the judgment of an unprejudiced tribunal. The report so made would carry with the public and the parties concerned exactly that degree of weight its judicial character and reasoning might impart to it. It could not be enforced by any Governmental process. There is no sheriff behind it. But, if well reasoned and fair, it would represent the moral weight of an aroused and advised public opinion. This is, for every practical end, "compulsory" arbitration.

Did some such machinery exist, and could such an investigation be made, there is reason to believe that a timely report now submitted would, in the present case, afford to one or both parties concerned an opportunity to withdraw creditably from their position both false and perilous. Were the facts undisputed or clearly proven, and the recommendations made thereon judicious and reasonable, it would at least remove from the path the impediment of false pride—that fatal stumbling-block in the case of nine strikes out of ten. An opportunity gracefully to recede would be offered. This done, should either party persist, the responsibility for obstinate persistence would be placed. Experience shows that public opinion could then be relied on to enforce process.

It was so in Massachusetts in the case of the strike of 1877. The result on that occasion was all that could be desired. There seems no sufficient reason to doubt that, if it were possible to have recourse to the same procedure now, a like practical result would ensue. Great public inconvenience and private loss might thus be averted. But, in case they were not averted, and the struggle went on, no additional harm would have been done. Merely, investigation and public opinion would have been brought into play, in this case fruitlessly. That, surely, prejudices nothing and no one.—CHARLES FRANCIS ADAMS in "Evening Post," of New York.

The Metric System Abroad.

Russia took preliminary steps nearly a year ago looking toward the adoption of the metric system. It is a little odd that of the four nations most aggressively reaching out, in one way and another, for foreign trade, Germany alone has established the international system of weights and measures. Russia probably has decided to do the same thing; in England and America most of the argument, practical as well as theoretical, is in favor of adopting the metric system, and the change is prevented mainly by inertia. The consuls of both countries have testified that their foreign trade was injured by the non-adoption of the metric system, and in England a large amount of testimony favorable to the change has come from manufacturers and merchants. In Germany the change was effected quickly and with very little trouble. Possibly the expansion of German foreign trade has been promoted by the change. The Pittsburgh Chamber of Commerce is urging concerted action by the United States, Great Britain and Russia for the adoption of the metric system. Replies from commercial bodies all over the country favor-

able to it have been received, and communications to this end have been made to commercial bodies in England and Russia. —"Journal of Commerce."

Commercial Review.

NEW YORK, August 10, 1901.

MACHINE TOOL AND TRADE NOTES.

It is useless to attempt to say anything of the strike situation, as the news of that at present belongs rather to the daily and secular press. Aside from that the feeling of tool-builders is decidedly cheerful. Our correspondents tell an unusually uniform story, especially for the dog days, of plenty to do and more in sight. Below a few of them speak for themselves.

Detrick & Harvey Machine Company, Baltimore, Md., say: "We are extremely busy. We have absolutely nothing in stock and have not been able to complete any tools for stock for a long time. We are running entirely on orders, and as we are receiving a great number of inquiries we do not believe we will have an opportunity to complete any stock for some time to come."

Newton Machine Tool Works, Philadelphia: "The outlook of business in the machine tool line is better now than we have ever experienced. While we do not anticipate any boom, nor desire one, our prospects for business are exceptionally good. Last month we received more orders than in any month since we have been in business, and we have already received this month a very satisfactory volume of orders. One peculiar phase of our business at present is that about 75 per cent. of machines ordered are for the direct coupled electric drive."

The Kempsmith Manufacturing Company write: "So far as we see it, there is a renewal of interest in shop improvements and machinery equipment shown by the users of machine tools. It is of course well known that the ordinary run of inquiries was very decidedly interfered with by the machinists' strike. There seems, however, no condition to prevent the resumption of inquiries and consequent purchases, excepting what may be termed the extreme caution which generally succeeds unusual business disturbances. We believe that in the course of two or three months the buying movement will be in full swing."

Lodge & Shipley, Cincinnati, say: "Our business during this year has been excellent and the prospects are good. If it had not been for the strikes we think this would easily have been a record year."

Baker Brothers, Toledo, Ohio: "Trade with us the last two months has been very good. We are getting very little foreign trade, owing to the conditions existing abroad, but the demand in this country for our line of goods has been all we could ask."

Potter & Johnston Machine Company, Pawtucket, R. I., say: "Business with us continues to be satisfactory. We have at present sufficient work on hand to busily employ our full complement of hands, with considerable work on order and a good deal of new work in sight. Of course our trade is principally for the United States at present, with very little foreign business."

H. B. Underwood & Co., Philadelphia, write: "We have no reason to complain and are looking for a large fall business."

A well-known firm of builders of heavy machine tools writes: "There is a good amount of domestic business offering at fair prices. There is good demand for machinery for very short delivery, and stock tools are very scarce. There is practically no foreign business in our line."

L. W. Pond Machine Company, Worcester, Mass.: "We are receiving inquiries daily for planers, principally the larger sizes, and have booked a number of orders within the past month. Our business is increasing rapidly, and we have been obliged to double our working force since the first of July. Every indication points to a further increase of orders, and prospects look good for some time ahead."

On one day, July 29, Wilmarth & Morman Company received orders for fourteen of their "New Yankee" drill grinders, including several for export and four for the United States Government. Baker Brothers, Toledo, are to use the Wilmarth friction clutch on their line of key-seaters.

The Binsse Machine Company, Newark, N. J., has received an order for a 60-inch horizontal boring mill to go to Calcutta, for one of the Indian railways.

The Northern Engineering Works, Detroit, Mich., recently shipped to the Baker Iron Works, Los Angeles, Cal., a three-motor electric traveling crane for their new shop. This firm have also installed in the plant of the Aermotor Company, of Chicago, a three-motor electric crane, 60-foot span, fitted with alternating current motors and equipment. This crane is of a special type designed for handling pipe, and is an interesting instance of the application of alternating current to special electric crane service.

The Cataract Tool and Optical Company, of Buffalo, N. Y., say: "The exhibit in the Machinery Hall at the Pan-American Exposition is attracting a great deal of attention and now that the attendance to the Exposition is beginning to increase rapidly and fulfill the expectations of the Buffalonians, we feel that as an advertising feature the various exhibits are invaluable to the company's interest and will result in considerable business. We note that the representatives in the South American countries show a great interest in everything connected with the exposition, and while the interest is perhaps not as great in the Machinery Hall as in some other lines, it is still quite marked. Personally, we can trace a number of sales through our exhibit at the Exposition and at present are considerably behind with our orders. Our foreign trade has shown a marked increase, especially with Switzerland. One of the few orders we have received from Spain goes to Barcelona this week."

CHICAGO MACHINERY MARKET.

Since about the first of August there has been a slackening in the demand for machinists' supplies. Trade is by no means dull, for it compares favorably with a year ago. But it is not up to the July mark so far this month. One reason for the diminution is that agricultural implement makers quite generally shut down about the close of July, the end of their season. Within a few days some of them will have resumed operations for the new year, suspension of activities being only sufficiently long to make necessary repairs. The implement people have had a good year. Some of them who last season carried over many implements, especially in the Northwest, have not only sold the hold-overs but all they could build during the past year and are now left with practically no product on hand. They therefore enter upon the new year in better condition than a year ago.

But perhaps the greater reason for the comparative lull in the machinists' supply trade is the extensive steel strike which at this writing threatens. Before this appears in print, the extent of the strike will perhaps be accurately measured, but during the uncertainty of the past week or two, the disposition of manufacturers generally has settled into one of conservatism. Not knowing what was ahead they bought sparingly of almost everything, the supply of which was not threatened by the labor troubles. As a matter of actual fact there has as yet been little interference to shop activity through the scarcity of material any more than has prevailed for several months past, due to the overcrowded condition of mills. But it is observable that mills have recently been inclined to run mainly on regular sizes and that the buyers of special material have had a hard time getting the shipments they required. A number of plants have been compelled to suspend operations because of this difficulty in procuring special shapes and sizes. While the "pick up" trade in shop furnishings has not been remarkably lively, a few large orders recently placed for shop equipments have helped to pull up the average. Aside from the strikes there is nothing visible that bodes ill for the Western machinery trade.

The Chicago Belting Company reports that the fall trade which usually comes first in evidence about the middle of August seems to be on the ground this year a little earlier. There is nothing in their trade at which they complain. The Bennett & O'Connell Company say trade is good for summer. For both emery wheels and plating outfits there is a fair demand. The Reeves Pulley have closed several good contracts within the past few days and report the aggregate trade quite satisfactory in volume.

Finding the Variations in the Velocity of Steam Engine Flywheels.

The method of demonstrating the irregularity of angular velocity in a steam engine flywheel described in issue No. 23, page 646, is ingenious and simple, but I should look for trouble with the scriber on account of the high speed at point of contact. The face of wheel must be smooth and free from holes and run fairly true, and those conditions are not easy to obtain. A wheel 16 feet diameter running, say, 100 revolutions per minute, will have a surface travel of about 60,000 inches per minute. If the scribing spindle makes 6,000 revolutions per minute the loops described will be about 10 inches apart.

The angular variation allowed by some electric companies varies from one-tenth to two-tenths of a degree, which on the face of this wheel would measure, say, from 5-32 to 5-16 inch. This, no doubt, would be sufficient to show the trend of things, but measuring on loops 10 to 12 inches apart, and not getting all of this distance on one loop either, would make it a little uncertain. These loops being so far apart could not be read, so to say, but would have to be measured, and this would be rather slow. The scribing spindle could revolve faster and make smaller loops, but this would not help matters, as the difference between each loop would be proportionally smaller.

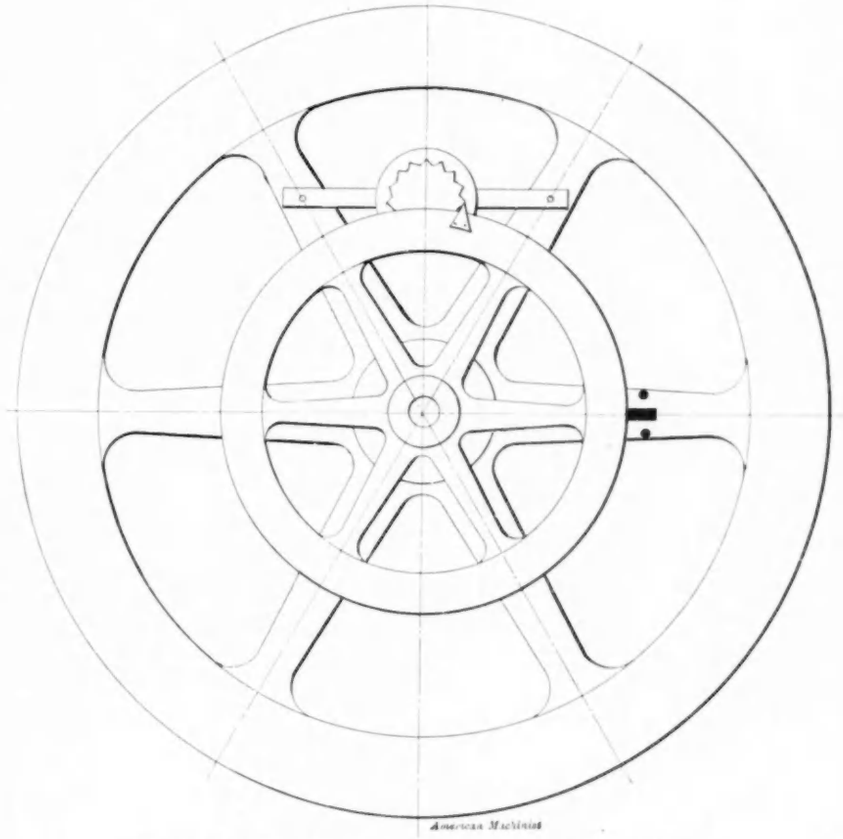
Some time ago this question of differential angular velocity worried me quite a little, because, figure as one will, while the idea suggested by Mr. Mansfield to make wheels twice as heavy as figured, is a good one, it is expensive, both in cast iron and in difficulties when the weights approach the limit of handling capacities.

To investigate this matter I devised the apparatus shown in the accompanying sketch, in which the large wheel is the engine flywheel, the small one is an auxiliary driven from the larger by a light rubber band, and the round disk shown is a dial on which the variations are recorded after the manner of a Bristol recording steam gage.

My first idea was to have a lever scribe a line on a slowly revolving drum, the lever to derive its motion from the varying relative position of the engine and auxiliary wheel, but I found the plan adopted much easier to carry out. The idea is that a fairly heavy wheel, say 30 to 40 inches diameter, and having a rim section of 3 to 4 inches, will, with a flexible drive, run at a practically uniform speed. The engine wheel is subject to variations, and these will show on the dial, as indicated but exaggerated in the sketch. The dial is made to slowly revolve by a system of pulleys, not shown. In the case I speak of it made a revolution in about 15 seconds.

The recording pencil is arranged at the edge of the auxiliary wheel, and it is worth remarking that we had quite a little trouble with it from the centrifugal force interfering with its free action. It was arranged to lift off the dial while starting and stopping.

The auxiliary wheel should run on a stationary shaft to eliminate the friction of rest between it and the engine shaft should it be mounted on that shaft. The distance between the tops and bottoms of the wavy line on the dial, measured radially, will give the actual variations and the action can be "read" easily. As might be supposed, the results showed that speed is more effective than weight—in this way, that half the weight will show better results than half the speed for which the other moving parts of the engine may be responsible.



APPARATUS FOR FINDING VARIATIONS IN FLYWHEEL VELOCITY.

A constant of 1,500,000 in the Buckeye Engine Company's formula was found sufficient for a speed of 250 revolutions per minute, but a speed of 200 revolutions was insufficient.

Time did not allow a thorough investigation of the subject, and since the apparatus established the fact that the wheel in the particular case investigated was heavy enough, it was laid aside; but I wish someone would fit one to a slow-running engine and, after some experimenting, let us know the results. An instrument driven in the same manner as a tachometer, and arranged with a light and heavy wheel side by side and a recording device between them, the light wheel being driven from the engine, could be used. H. F.

Thomas Jefferson as an Inventor.

Jefferson was the author of the coinage system of the United States, and he desired to apply the decimal system to all measures. Had his advice been followed our tables of measures to-day would be: "Ten points one line, ten lines one inch, ten inches one foot, ten feet one decad, ten decads one rood, ten roods one furlong, ten furlongs one mile."

One of Jefferson's last acts before leaving the Department of State was to issue a patent to Eli Whitney for the cotton gin. One of his own inventions was a hemp break, which, he says, "has long been wanted by the cultivators of hemp, and as soon as I can speak of its effects with certainty I shall describe it anonymously in the public papers in order to forestall the prevention of its use by some interloping patentee."

He invented a pedometer to measure the distances he walked. He sent one to James Madison, with the following explanatory letter:

"To the loop at the bottom of it you must sew a tape, and at the other end of the tape a small hook. Cut a little hole in the bottom of your left watch pocket, pass the hook and tape through it, and down between the breeches and drawers, and fix the hook on the edge of your knee band, an inch from the knee buckle; then hook the instrument itself by its swivel hook, on the upper edge of your watch

pocket. Your tape being well adjusted in length, your steps will be exactly measured by the instrument."

Jefferson's most important invention was a plow. Edward Bacon, his overseer, says: "He was very ingenious. He invented a plow that was considered a great improvement on any that had ever been used. He got a great many premiums and medals for it. He planned his own carriage, buildings, garden and fences and a good many other things. He was nearly always busy upon some plan or model."

Jefferson's plow received a gold medal in France in 1790. During his European tours he had been struck with the waste of power caused by the bad construction of the plows in common use. The part of the plow called the "mold board," which is above the share and turns over the earth, seemed to him the chief seat of error, and he spent many of the leisure hours of his last two years in France in evolving a mold board which should offer the minimum of resistance. He sent the original design to the Royal Agricultural Society of the Seine. The medal which was awarded for it followed the inventor to New York, and eighteen years afterward the society sent him a superb plow containing his improvement.

During his five years in Europe, Jefferson kept four colleges—Harvard, Yale, William and Mary and the College of Philadelphia—advised of all new inventions, discoveries and publications that seemed to him important. It was he who sent to the United States the first anouncement of the success of Watt's steam engine, by means of which, he says, "a peck and a half of coal performs as much work as a horse in a day." He learned of this wonderful mechanism from Mr. Boulton, a partner of Watt, and as soon as he could be spared from Paris he crossed the channel to London to see it in operation, but, much to his disappointment, he was not allowed to make a minute examination. He was permitted "to view the outward parts of the machinery and cannot tell whether the mill is turned by the steam immediately, or by a stream of water which the steam pumped up." He does not seem to have perceived the possibilities of this invention for motive power in manufacturing and large industries, but associated it in his mind with domestic conveniences. He expresses a timid hope "that they may make it available for pumping water to the tops of houses for family use. Every family," he continues, "has a kitchen fire, small indeed, but sufficient for the purpose."

He notified Congress of the invention by a French mechanic of a machine now familiar to every workshop, "by which wheels and other parts of a watch or clock can be multiplied in duplicate as many as are desired, so exactly alike that one can be used in place of another without altering or fitting." A similar machine, he said, had been made for the purpose of reproducing "the parts of a musket lock by hundreds or thousands, or any number desired, so exactly that they can be put together as neatly and exactly as if each had been made by hand of the same size and pattern, so that one part can be replaced by a duplicate at will." He wisely predicted the great utility of this invention in lessening the cost of articles of common use, and suggested that the principles should be applied to all manufacture.—WILLIAM E. CURTIS, in Chicago Record-Herald.

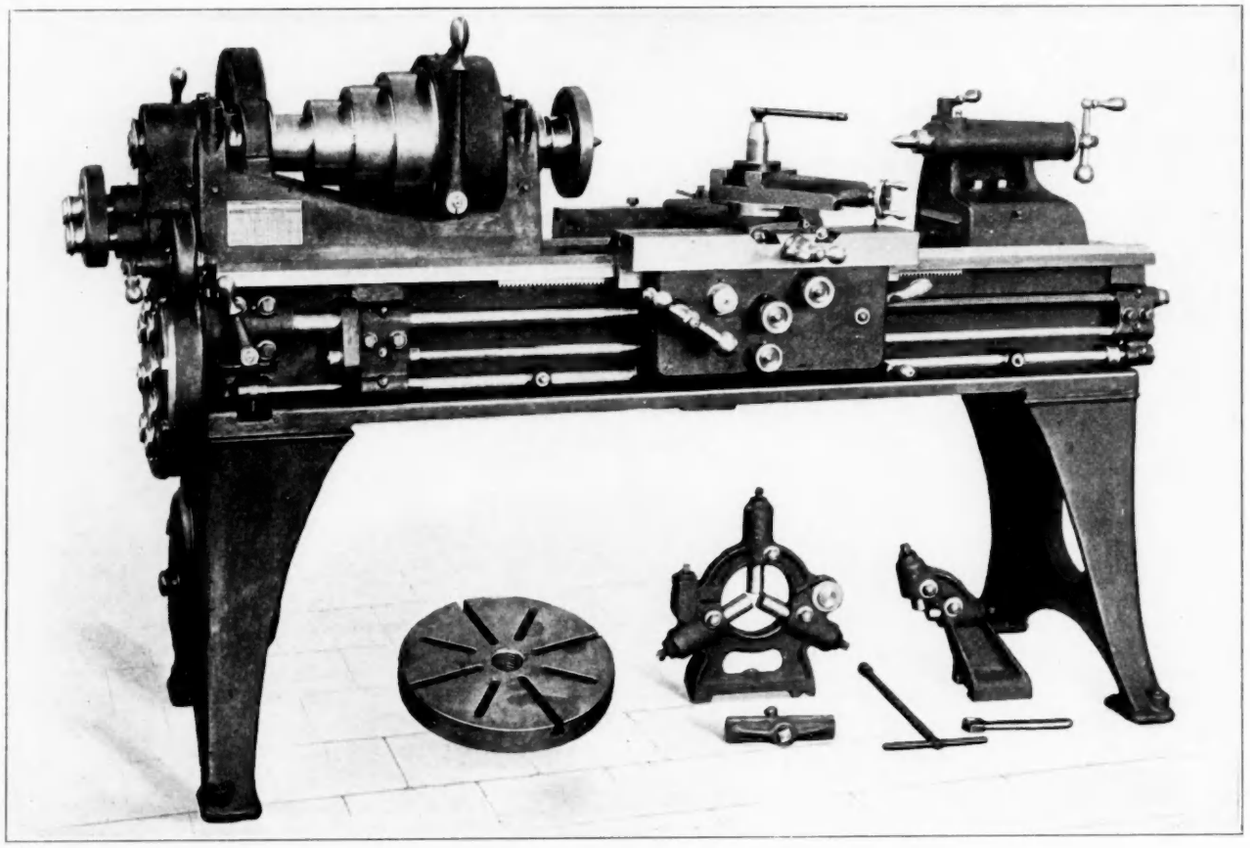


FIG. 1. GENERAL VIEW OF NEW ENGINE LATHE.

A New Engine Lathe.

Our readers who have followed the development of the lathe having its change wheels attached in such a manner as to be available by the movement of a lever or by throwing in a clutch instead of by the unscrewing and screwing up of nuts, etc., as in the older styles, will be interested in the lathe that we illustrate by the accompanying engravings.

In this lathe the change gears ordinarily employed are placed upon a disk and within a shield at the end of the lathe and so arranged that by rotating this disk any one of the gears may be brought into line with and clutched to the lead-screw. Only the gears in use rotate and the gear clutched to the lead-screw is at that time supported not only by its attachment to

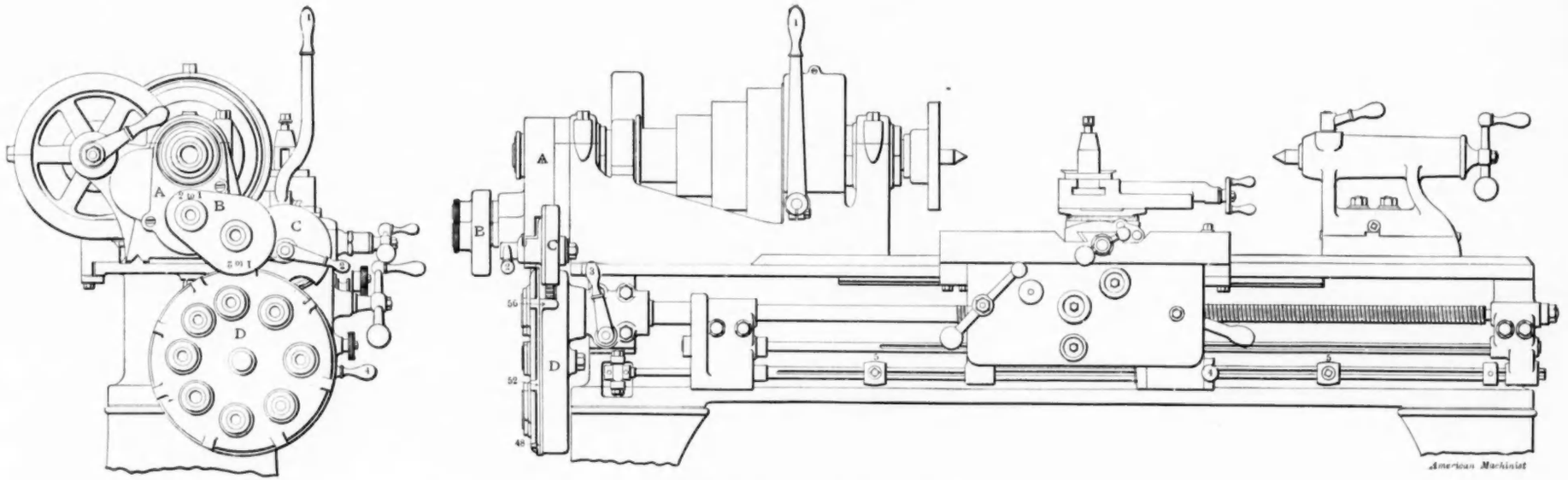


FIG. 2. END AND SIDE VIEWS OF NEW LATHE.

the disk but also by a stud attached to a sleeve upon the lead-screw which stud enters the change gear in use and thus gives it the support of the lead-screw bearing. Fig. 1 gives an idea of the appearance of the lathe, while Figs. 2 and 3 show more of the construction. Only the disk which carries the change wheels is rotated when bringing a given gear into position and this has a long bearing upon the stud shown in the sectional view Fig. 3. The other portion of the case is fixed and forms a cover for the gears having an opening at the top through which the intermediate on the swinging plate reaches and engages with the gear clutched to the lead-screw. At the side of each change gear is a projection from the disk, which projection comes just to the hight of the pitch circle of the corresponding gear and on the swinging arm that carries the intermediate is a similar projection that comes just even with the pitch line of the intermediate. The result is that when these two projections are brought together by dropping the swinging arm the intermediate and the lead-screw gear are properly engaged without attention on the part of the operator.

A sufficient range of feeds or screw pitches cannot be obtained by changing gears on the lead-screw only, therefore, provision is made at the headstock for various ratios of speed. This is accomplished by means of three pairs of gears, contained in cases, which give the following ratios, viz.: Even, 2 to 1, 4 to 1, and, when the latter two are reversed 1 to 2 and 1 to 4 are obtained, resulting in five different rates of speed for the fixed pinion which meshes with the intermediate gear necessary for transmitting the motion to the gear on the lead-screw. The gears contained in these cases are similar to those in the disk, and are placed in position by slipping them on the reduced ends of the spindles provided with clutches to engage them, and when in position for operation are really supported by the spindles instead of the cases, the only object of which is to facilitate handling and to provide suitable guards.

Inasmuch as only one pair of gears can be used at a time, a receptacle is formed in the leg of the lathe to receive the other pairs, one being suspended from a stud projecting from the rear of the cabinet, while the other is similarly placed on the inside of the door; then, by opening the door either is available and can be placed in position in a moment. Either of these pairs of gears can be reversed and a table together with the required designating marks upon the gear cases enables the gears to be readily brought to position for a thread of any pitch.

The range of the threads that can be cut on this lathe is from 2 to 56 per inch and the turning feeds are from 8 to 224 per inch. All changes required to cut any of the threads or to give any of the feeds between the extreme limits can be made while the lathe is in motion.

The direction of motion of the feed train is reversed by a lever at the carriage apron and collars are placed upon the rod which give an automatic stop for the carriage either when feeding or screw cutting.

The gears for this are placed between the end of the headstock and an apron secured to it, and are driven by a pair of slip gears on the spindle, which may be slipped out of contact if no motion is desired. The reversible spindle engages the forward or backing gears by means of a positive clutch.

It will be noticed that the lathe has a friction clutch for the back gears, and it is believed that this will prove just as advantageous as it has proven to be on the screw machine or turret lathe.

The other features of the lathe will be readily understood from the engravings and we give a few data as follows:

Front bearing of spindle is 2½ inches diameter, 4¼ inches long; back bearing, 2⅛ inches diameter, 3½ inches long; hole through spindle, 1 5-16 inches diameter; cone diameters, 4, 6, 8, 10 inches; width

of belt, 2½ inches; ratio of back gearing, 10; diameter of tailstock spindle, 1⅞ inches; actual swing over bed, 17 inches; swing over carriage, 10 inches; 6-foot lathe takes between centers, 2 feet 5 inches; weight of lathe with 6-foot bed, 2,100 pounds.

It is made by the Springfield Machine Tool Company, Springfield, Ohio.

The School of Philosophy and Principles.

The graduate of the Rensselaer Polytechnic Institute need not be afraid to stand before any group of men in the world. The history of our nation proves that. Look about you and you may see the story of the body of alumni into which you now enter written across the face of the land in railroads and bridges, in furnaces, steel mills and docks, in waterworks and in cities, and you may see it written even on the faces of the oceans in the wakes of the great ships.

I am disposed to think that in some ways the training that you get here is even superior to that of many other schools, for a reason that is not always understood or appreciated. When the poet said, "Sweet are the uses of adversity" he summed up in six words a great philosophical truth, and what I am about to say now is not calculated to help your president when he goes out asking for money for laboratories and shops, and I beg that you will not mention it outside of this hall. I suggest that the training of the Rensselaer Polytechnic Institute is better than that of most other schools of its kind, because of the comparative poverty of the Institute. The fact that you have not had here pattern shops and foundries, machine shops and laboratories on the grand scale of most of the big engineering schools has been, in a way, your good fortune. It has kept in force and has extended the original idea of the Institute, which is, to make philosophers rather than to make artisans and machinists. The first force of the teaching here has always been on principles. Application has been permitted to come as it may. This, I judge, is the correct theory of an engineering school, and further, I take it that there will be a reaction from the overdevelopment of the schools of application and a return to the methods of the schools of philosophy and principles.

What I am saying just here seems to me of so much importance that I venture to repeat it in other terms. Not long ago I was talking with a distinguished graduate and a former director of this school, now the head of another engineering school. I asked him how it had come about that England had produced so many good engineers with no engineering schools. He answered quickly: "You must not forget John Macquorn Rankine." Another graduate of this school who has done some wonderfully bold and original bridge work and has put himself in the first rank of suspension bridge builders, has often said to me that he never found himself in a place that he could not get out of with Rankine's "Civil Engineering" and Bartlett's "Mechanics." In other words, we keep coming back to the original proposition that if you are master of the principles of your art you can go as far as your natural abilities will allow. If you are not the master of those principles no knowledge of technique will ever make you an important engineer.—Col. H. G. Prout, to the graduating class of Rensselaer Polytechnic Institute.

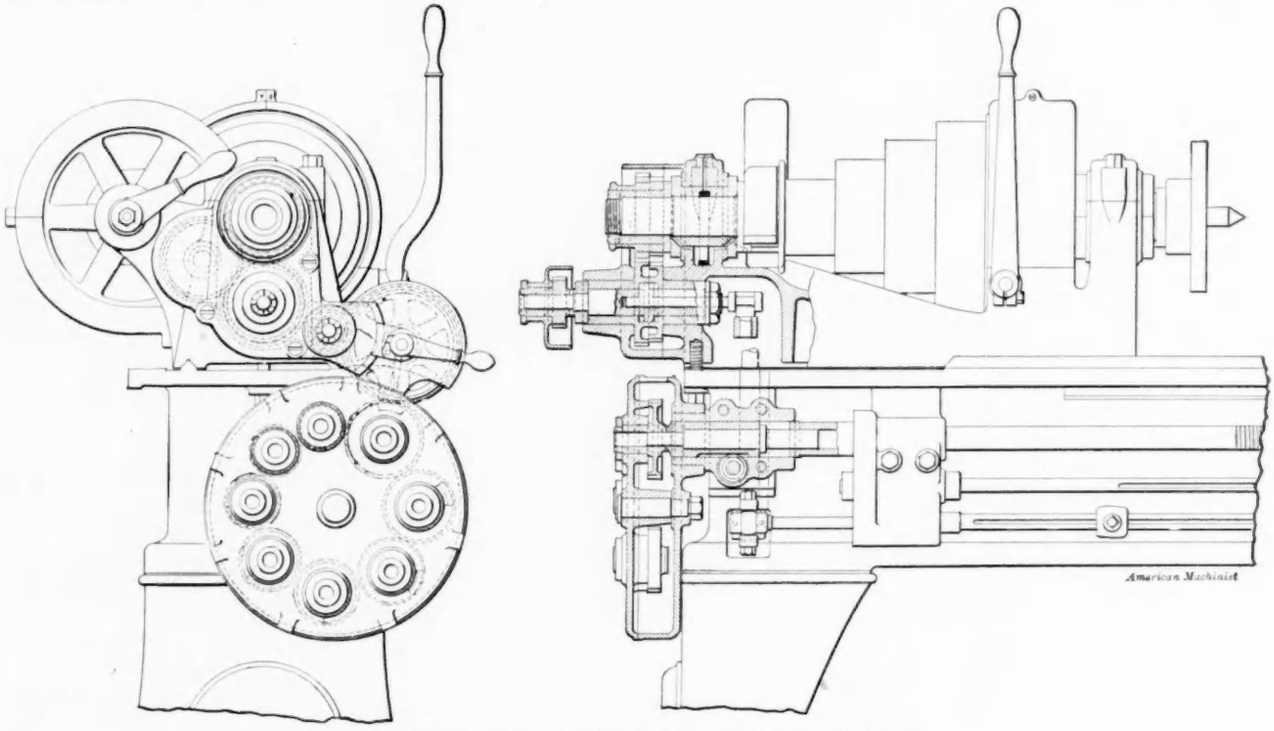


FIG. 3. PARTIAL SECTION SHOWING FEED GEAR MECHANISM.

Spacing the Teeth of a Rack.

TRANSLATING CIRCULAR TO DIAMETRAL PITCH.

A short time ago I had a rack of 10 diametral pitch to cut for a planing machine and no facilities for spacing the teeth. The only available machine that I could possibly use for this work was a shaper with a cross-screw of 4 threads per inch to move the platen. The problem was to arrange the feeding mechanism so as to move the platen a distance equivalent to the pitch of the rack, which is equal to

$$\frac{3.1416}{\text{diametral pitch}} = \frac{3.1416}{10} = .31416$$

After giving the matter some thought I decided to make a spacing attachment for this shaper which would not be limited to this piece of work, but would space the teeth of any diametral pitch. The attachment is very simple, and, thinking that it might be interesting, and possibly instructive, to the readers of the "American Machinist," I send herewith a drawing that, I think, will illustrate it clearly.

Suppose we wish to space divisions of 1-10 inch each with this screw of ¼-inch pitch.

If the screw had ten threads one turn would obviously space correctly for a rack of 1-10 inch pitch. As the rack has four threads it must be turned 4-10 of a revolution, and if any two gears having this ratio be mounted with the larger one on the

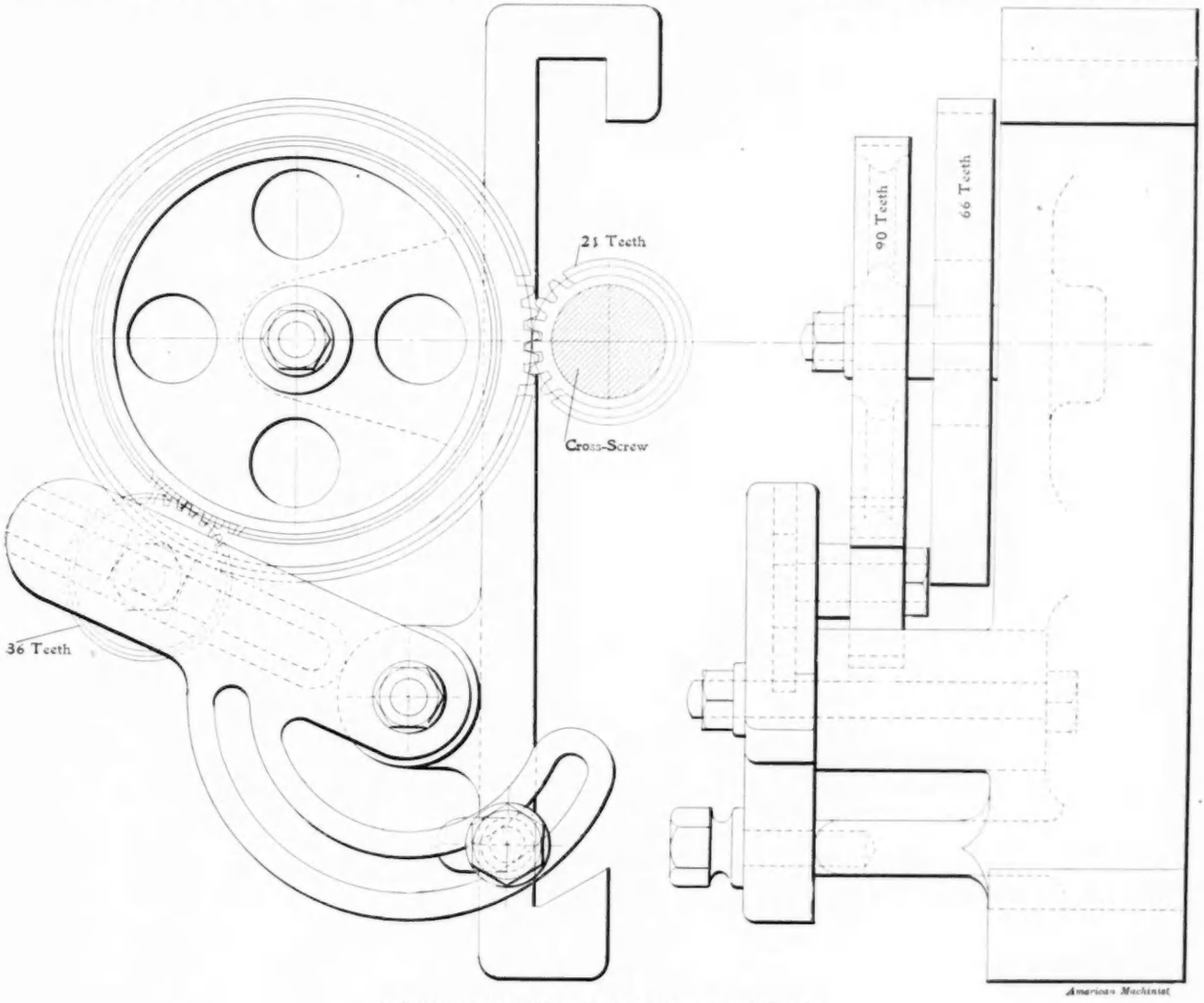
screw, the smaller one must be given a complete turn in order to space for 1-10 inch pitch. Multiplying both terms of the fraction 4-10 by any number—for instance, 9—gives

$$\frac{4}{10} \times \frac{9}{9} = \frac{36 \text{ driving gear}}{90 \text{ driven gear}}$$

Since the circular pitch of any tooth is equal to $\frac{1}{\text{diametral pitch}} \times 3.1416$, we have only to use two additional gears in the ratio of 3.1416 to 1 in order to change the spacing from diametral to circular pitch. Two gears having closely this ratio are gears in the combination. The combination can be proven by the following arithmetical calculation:

$$\frac{36}{90} \times \frac{66}{21} = \frac{2376}{1890} = 1.2571$$

and 1.2571 multiplied by .25, pitch of cross-screw = .314275, the distance that the work moves for each revolution of the 36-tooth gear; .314275 pitch cut, minus .31416 desired pitch, equals .000115 error, which is not enough to be considered in general practice; in fact, it is within the degree of accuracy of more than the average machine in machine shops.



CUTTING A DIAMETRAL PITCH RACK ON A SHAPER.

66 and 21 and the reader will observe that they are mounted on the attachment.

It follows from what has been said that the 21 and 66-tooth gears are not considered as change gears, but are used to translate from circular or linear pitch, to diametral, the other two being the change gears, and found in the same manner as we would find gears to cut a screw of 10 threads per inch. In other words, the width of the spaces divided by this combination will be 3.1416 times greater than they would be without the 21 and 66-tooth

By applying this plan to the lathe, worms can be cut to mesh with worm-wheels that have been cut to the diametral system. In use I do not drive by the 36-tooth gear, but use it as an index, because the platen can be moved much more easily by the handle on the cross-screw and at the same time relieve the train of gears from the strain that they would be subjected to by a handle on the 36-tooth gear. All that is necessary, is to have a fixed mark on the 36-tooth gear and turn the handle of the cross-screw until the 36-tooth gear makes one revolution. The arrangement on the attachment is: 21 gear on the screw, 66 first gear on the intermediate stud, 90 second gear on the intermediate stud, 36 driving or indexing gear.

Philadelphia, Pa. J. S. R.

Boxing Machine Tools for Foreign Shipment.

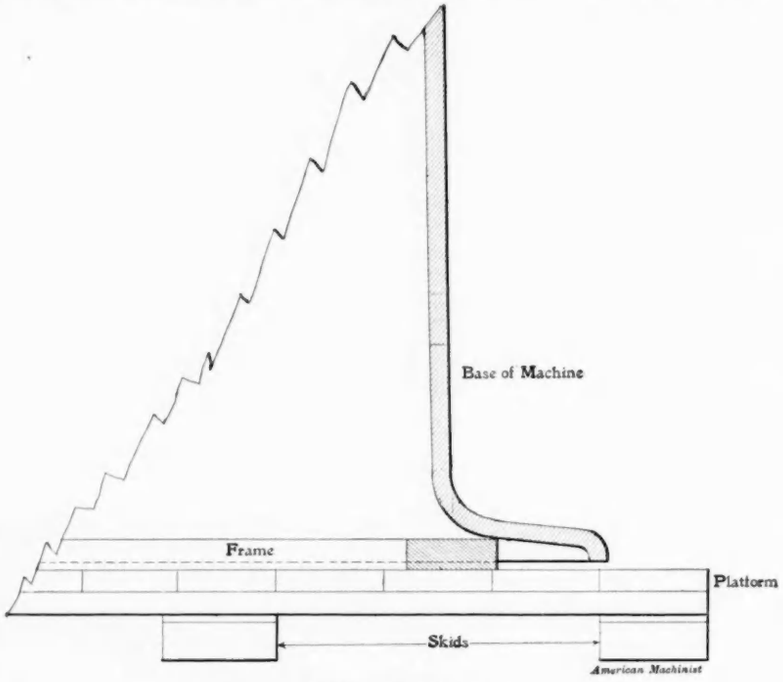
BY J. M. RICHARDSON.

Making and packing a rough box seems an absurdly simple matter, but when its contents are as expensive as are machine tools, and its destination is perhaps some distant quarter of the globe, then the subject presents a slightly different aspect.

Let us briefly consider some of the requirements of preparing machinery for going abroad. As the freight rates on ocean steamers are based largely on the cubical contents of shipments, instead of weight, it is needless to say that the volume of all boxes and cases should be reduced to the minimum, and the boxes themselves must be tightly constructed, as crating will not answer as in domestic shipments. We must also bear in mind that what we are

boxing will be subjected to no gentle usage and must be so fastened that it can be tipped end over end or sideways and remain in that position indefinitely without regard to the inscriptions "This side up," "Handle with care," and the like.

In making heavy boxes or cases for machinery, it greatly facilitates matters to have a solid table or bench fully as large in area as the largest piece to be nailed, and on the side and one end have a solid projecting strip two inches or so in hight. This serves as a "square" when placing the boards for the sides and the skids for the platforms or bottoms of the case. The lumber generally used for this sort of work is rough spruce 2x4 inches and heavier, as the nature of the work requires, for skids and inside bracing. The outside or covering boards are 1¼-inch spruce, matched



BOXING MACHINERY.

and planed on one side, leaving them 1⅛ inches in thickness. Boards planed to ⅞ inch are also used in cross boarding the platforms and in other places where they are sufficiently strong, as for small boxes, etc., to fasten inside the large cases.

The inside dimensions of the large box or case must be as small as possible, at the same time allowing at least half an inch clearance between any weak part and the sides or top, so that, if the box becomes racked or strained, it will not come in direct contact with any piece of a fragile nature.

When making the platforms, cut the skids (as many as necessary) the length of the outside of case. Bevel the ends, and place on the nailing bench before mentioned, having the two outside ones placed the full width of inside of case. Next, cross board the skids with 1⅛-inch matched spruce; remove the tongue from the first board and place 1⅛-inch back from the ends or toes of the skids, and complete the same distance back from the other end of same. This space is afterwards taken up by the ends, which come out flush with the skids. Now, cross-board again with ⅞-inch boards, and the result is a platform of great strength.

If the machine to be placed on this has a wide base, as shown in the sketch, and is secured flat to the boarding, there is a liability of the flange or protruding part of base being broken by a sudden jar or wrenching strain. This has been known to happen, and it is considered the best practice to nail a little frame on the platform of such a size that the bearing will come about as shown, the bottom of the casting being raised about ¼ of an inch. Chop out a little place with a hatchet in the middle of each end of frame on top, for there is usually a heavy fin on the casting inside, where the core was pasted which has never been dressed, as it is out of sight, and cutting this place allows the casting to rest squarely upon the frame without rocking.

The sides of the case are next to be considered. They are made the same width as the boarding on the platform and of a hight equal to that of inside of box, plus thickness of skids and boarding of platform and top boarding besides. The side boards are fitted on the nailing table against the projecting edges which keep them square, and the first and last one are to be free from tongue or groove on the outside edge, and also have one corner sawed or chopped off a little, where it will meet the bevel on the skids. They are now held together by nailing on a board having a square edge and placing it back 1⅛ inches from the ends of these side boards. This gives a rest for the top boards later on and leaves them flush with sides.

A piece of 2x4-inch spruce is next put on the whole length, as near the middle of sides as practicable. This position must be determined by the shape of machine to be boxed and placed where clearance will be ample.

This piece can be at first fastened on with ten-penny nails, then turn the whole side over and securely nail through the thin boarding into it.

As soon as a machine is placed in position on its platform it should be wiped clean with waste wherever there is a finished part liable to be attacked with rust, and then greased over very thoroughly with some anti-rust preparation. This is of the utmost importance, as dampness and sea air will leave tell-tale marks on any forgotten place, and if all machine oil is not carefully rubbed off of the surfaces before the heavy grease is applied, it leaves a film which prevents the thicker substance from adhering directly to the metal, and if the box remains where the heat is considerable the oil will run first, causing the rust preventive to look streaked and hindering its full efficiency. Gear covers and guards will often have to be removed, and then replaced, in order to do this work as it should be done.

No specific directions can be given for packing and bracing a machine, for the conditions differ in every case, and I can give but a few general hints. If a machine stands on legs they are frequently removed, so that the body of the machine can be more securely fastened, besides economizing space. All independent parts, such as small tools and fixtures, and also extraneous parts of the machine itself that are liable to breakage, and that can be removed, are usually packed carefully in separate boxes, which are fastened and braced to the interior of the large case. The cupboard itself of some machines having a cabinet base will often serve as a receptacle where a large number of small pieces can be stowed away.

Countershafts are usually taken to pieces and there is generally room enough on the platform to bolt the hangers, and the shaft and rods can usually be placed there, too, close up against one of the sides of the box, or else on the 2x4-inch pieces on the middle of the sides before mentioned. The belt fingers, etc., are packed with the other small stuff, and the pulleys must be fastened wherever a suitable place can be found, which is seldom twice the same.

When the machine is of a shape suitable to be placed on the little frame nailed to the platform, pieces of board should be placed firmly against the edges of the base on every side and extend out to the edge of the platform and be nailed down securely. This keeps the base from any sideways play far better than any coach bolts.

Always use paper between any part of the machine and any form of brace or

support. This protects both paint and finished surfaces, keeping the latter especially from the moisture of the braces, which are usually of green stuff. Newspaper is all right to go against paint, but it should not be used against a bright surface, for, absurd as it may seem, it is liable to cause the part to rust. There seems to be something in the ink which has a bad effect. Oiled paper is the proper kind to press against finished parts.

When the sides of the large cases are erected in position against the platforms they should before nailing be separated from the floor by resting on a shingle placed at each end. This is to insure the entire weight of the box coming on the skids, and the taper of a shingle also makes it handy in getting the edge of the second side parallel or in line with the first, for if, when sighting across, they are found to be slightly out, one end can be raised or lowered a little by tapping the shingle with the hammer.

A stringer is usually nailed across from one side to the other at each end into the 2x4-inch strips along the sides; a long clamp being first stretched across the top to draw the sides up against them until nails can be driven.

The case must now be "squared up," and for this purpose halve together two strips at the ends 3 or 4 inches wide and about 4 feet long, with a third piece let into these diagonally for a brace for the try square. Rest this on the tips of the skids which project by the platform a distance equal to the thickness of the boards used for the ends and see how the sides come. Frequently they will have to be sprung quite a little to get them to stand plumb and then anchor them temporarily with an outside brace against the floor or some solid object.

The inside bracing and packing must now be attended to, and this often requires some study and skill to secure from all directions in an absolutely solid manner. Blocks and braces should be solid in themselves, and all principal ones be placed against a part of the machine strong enough to support its entire weight if it should be tipped that side up, and whenever possible have all blocking with the end grain of the wood towards the machine, for if placed sideways it soon shrinks and then things will be found loose as this class of lumber is never very dry. Endways this shrink will not be noticed, it is so slight. Have the other end of all the principal braces rest against a long piece which will have a bearing on several boards where the box is completed, if possible, thus dividing the pressure and taking it off the outside boarding as much as possible.

After every needful brace has been firmly set in position, and as many tie bars as are necessary set between the sides at the top for the double purpose of securing them and affording a support to nail the top boards to, we commence to place the end boards and nail them to the sides, next placing the top boards on and nailing them to the ends, the braces and also the edge of the strip previously placed across the sides on which the top board rests. Now nail through the top of both the sides into the top covering for additional strength, and we have a box or case of great rigidity to withstand rough handling with safety to the contents. Band, hoop, or strap iron as variously called, is finally nailed about the edges, and the marking is done. All the common words used in shipping freight, such as "Fragile," "Keep dry," "Machinery," "Handle with care," "This side up," etc., can be most quickly applied with a stencil plate, and some firms apply the entire address, and all shipping directions necessary in the same manner, using a built-up plate of individual letters, figures and spaces that will lock into each other, making a universal stencil plate. In the case of foreign shipments, mark plainly the gross and net weights, also the length, width and hight of the box in inches.

Insuring Patterns.

By Frederick Conlin, Bethlehem, Pa.*

No single item is more in disfavor with the insurance companies than that of foundry patterns. This is largely due to the fact that in case of fire the damage to patterns, as a rule, results in total loss. If not actually destroyed they are made valueless through heat or water, and generally a partially damaged pattern will cost as much to be repaired as a new one. In addition to this there is a difficulty in adjusting values. The bone of contention is the question of depreciation. A pattern which has cost many hundreds of dollars may be obsolete, or after having been used once may never be brought into service again, and is of no value, the cost of its production having been charged to the cost of making the casting. Other patterns may have been in use for a long time and subject to heavy depreciation charges. The pattern which was worth the cost of production last month may suddenly become obsolete and valueless. This rapid fluctuation between a useful tool and a piece of scrap wood illustrates the difficulty of adjusting losses. The element of cost being almost entirely that of labor, which is absolutely lost when the pattern is "scrapped."

The value of the active pattern is the cost at which it could be replaced in the open market. It is a peculiar fact that patterns representing the very essence of a foundryman's business are a less tangible asset than the scrap iron heap. There is no foundry asset so susceptible of fluctuation and difficult of valuation, and, at the time of loss, so liable to suffer from the adjuster's depreciation charges, etc., as that of patterns.

* From Journal of the American Foundrymen's Association.

An important law decision defines patterns as tools. The plaintiffs were manufacturers of machinery and kept wooden patterns to make the iron castings needed for the machines. The policy insured their fixtures, movable machinery, engines, lathes and tools, and it was held that the parties intended to include patterns in the word tools and that the policy covered all patterns which from their size and shape admitted of being applied and managed by the hand of one man. The underwriters were no doubt influenced by this decision, as they at present stipulate that if patterns are included in a general policy, they must be specified in a separate item and a fixed amount stated as the limit of the risk assumed on them. It is further required that the figure given must not exceed 10 per cent. of the amount of the policy. Under certain favorable hazards the limit is sometimes increased to 20 per cent. This is, however, exceptional.

An insurance official in discussing the question of patterns, expressed the following opinion: "The temptation to show a high value upon obsolete patterns is too great for some men, and as a result insurance companies are frequently asked to pay high prices for patterns after a fire which were considered of trifling value before the loss." This is not a reflection against foundrymen generally. We base our estimates upon, say, 1,000 losses, and it takes but a very few individual fires where excessive claims are made to raise the average loss to a figure much above what we consider normal. This brings in the question of moral hazard which insurance companies are obliged to consider in connection with the risks which they assume. Again, as a rule, pattern shops which are extra hazardous are generally in close proximity to the place where patterns are stored. This adds considerably to the risk. Patterns should be stored apart from the pattern shop and, if possible kept in detached buildings.

Another high authority gave the following views: "In considering insurance risks the rates are based upon the average loss of, say, 1,000 fires. The average appraisal of loss runs less than 50 per cent. of the amount of insurance. If the underwriters should figure upon the basis of a total loss the present rates would be much higher. The trouble with a pattern, from an insurance company's standpoint, is that there is rarely any salvage. Hence, when we have a loss with patterns, it is a heavy one and away beyond all proportion to the percentage of loss on the balance of the other classes of property unsaved. In other words, there is no salvage to a pattern loss, while with ordinary merchandise it is sometimes surprising how much we recover from goods which have been in a litter covered with rubbish and ashes or soaked with water.

"In practice where the assured is inclined to be fair and meets us halfway, it is rare for us to have a serious dispute

as to these matters, we generally get together and settle the question without much loss of time."

Another official of a prominent insurance company gave the following definition of obsolete patterns:

"An obsolete pattern is one not liable to be used, and if the foundryman cannot show by his books that a pattern has been used in say five years' time, we consider it obsolete. The fact that a foundryman has put such pattern away and given it storeroom has no bearing upon its value. We store from time to time numerous papers and documents which we never expect to be obliged to refer to, and yet we give them house room having in mind the faint possibility that we may want to refer to them. The fact that we store these papers away does not make them valuable. I do not consider a pattern obsolete if you can take me to a casting made from it and show me that such casting is in use. All active patterns for castings in general use, articles of commerce, recognized as staple merchandise, in fact for any casting which would have a market value as a manufactured article, should be classed equal to new or cost of reproduction."

The insurance companies have striven to influence legislation so that the assured assumes the responsibility of fixing the amount of policy which has no bearing on the amount of payable loss. It is not until the loss occurs that the insurance company takes up the question of valuation.

The underwriters claim that it would not pay the insurance company to fix the values on patterns or any other class of property as this would entail the employment of an expert at say $25 per day to go and make such valuation. This expense would be more than equal to the insurance premiums received. Besides, the value of the patterns at the time of insuring would not be identical with their value at the time of the fire. The insurance company will not accept without question the foundryman's valuation and in case of loss, if the amount warrants the expense, the opinion of an expert is obtained to determine if the claim for loss is excessive.

Insurance policies usually include a clause which stipulates that in case of loss, if the insurer and assured fail to agree upon an adjustment, the matters in dispute shall be submitted to arbitration and in case the parties voluntarily proceed to settle their disputes in this way the court will enforce the award when so made. In case, however, the assured is not willing to arbitrate, any dispute becomes a question for the court to decide. The insurance companies as a rule taking their time in law suits, the adjustment of a claim this way is seriously delayed and it is found perhaps more advantageous to effect an early settlement by arbitration. In such case the underwriters will, for their own credit, appoint a first-class man and the assured will of course make the best selection he can. By these means the final decision is usually a just and equitable one.

The records show that the insurance companies contest from 1 per cent. to 2 per cent. of losses incurred.

It is a peculiar condition that while insurance officials object very much to the "valued" policy in a general way a number of them favor the adoption of its principles in the question of insuring patterns. As one worthy president of a prominent insurance company puts it: "We would much prefer to take the foundryman's idea of the value of patterns before the fire, rather than after it. His ideas are generally more conservative as to value at the time of taking out policy, having the premium to pay. If the assured should have a schedule of his patterns made out, putting a value upon each pattern and attaching such schedule to the insurance policy, we would be more inclined to accept the valuation given in such schedule than under any other method of adjusting pattern claims."

In practice it is not advisable for the assured to issue a schedule of patterns and prices to be attached to policy as there are so many changes liable to exist among the patterns, new ones taking the place of old ones, etc. The foundryman would not have the margin of "give and take" in adjusting such matters if each pattern insured was scheduled any more than if he should go by the exact schedule of his general inventory taken at the time of issue of policy. Such schedule would be radically changed, although the actual total value of property might not show much variation at the time of loss, in comparison with the amount of insurance agreed upon.

In case of casualty the insurance company is under contract to either reproduce the articles lost in as good a condition as they were before the fire or to refund in cash the cost of their reproduction. The value is based upon the market selling price at the time of loss. The law holds that if the property does not command a ready market, the price which it would bring at a present sale would not be considered a fair criterion of value, but the cost required to replace it, in its condition before the fire, would be considered the true value. Accordingly, any pattern in active use and in fit condition for molding, producing a satisfactory casting, is as good as a new one and worth as much.

Probably the most systematic method of establishing the true value of patterns to be used as an inventory for figuring up the firm's assets, or to serve as a schedule giving a true record of patterns at the time of fire, is to keep a pattern book, in which should be recorded the name and number of each pattern, its cost or value, all entered in columns under classified headings of active, active worn, semi-active, emergency and obsolete; every pattern broken up or rendered worthless to be taken from such schedule, every new pattern added to be entered. Patterns which might be safely considered as obsolete should be charged off. This classification is to be made upon some fixed basis.

The following may serve to suggest the general classification of the various patterns in regard to their durability and earning power. There should be no depreciation charged against an active pattern. To be useful it must be kept as good as new, as it is a most unprofitable policy to work with patterns in any other than the best possible condition. Patterns classed as active worn are those which are not sufficiently worn to be considered out of service.

The active worn pattern should be determined in accordance with the wear and probable extent of durability. The foundryman's judgment must be relied upon in classifying, but a 50 per cent. depreciation should be charged off, in case the pattern should be considered sufficiently worn to warrant its transfer from the active list. In making up the valued schedule the premium to be paid on the amount of risk will tend to make the classification come well within conservative lines.

The customer's patterns should be considered active.

If service is liable to be required at any time, the semi-active pattern is worth the cost of a new one as its earning power would be the same as if new. It is, however, advisable to deduct a fair depreciation from a pattern of this class, say, 15 per cent. per annum, as, with the rapid development in all mechanical pursuits, the patterns of to-day are liable to be obsolete in from five to ten years. If, however, the pattern is one which has been made for a certain part of machinery in service but only required for use in case of breakdowns, such pattern should be classed as "emergency" and be charged with depreciation according to its durability and earning power. To establish a fixed basis for valuation the rate charged off should be 25 per cent. per annum.

If a pattern has been made to fill a customer's order for castings, notwithstanding the fact that this item of its cost has been considered in the charges for the casting, and provided the ownership of such pattern remains with the foundryman, it should be considered an asset, regardless of the conditions under which it was made, and if either active, semi-active or emergency, it should be entered and considered upon its classified basis of valuation without discrimination.

When the casting made from a pattern is not liable to be put to further service, or if the pattern is for a machine or a portion of one which has been thrown out of service and abandoned, such pattern is useless and obsolete.

Obsolete patterns which could be applied to other uses than those for which they were originally intended should be considered as of little or no value, as they would require more or less altering before

available and are "dead-wood" until brought into active service again.

An active pattern may pass into semi-active, if the demand for its use falls off, and it may eventually become obsolete, if found of no further service, although its condition may be good. An annual survey would determine all this and lead to a revision of the schedule, but if in the interval a fire should occur, the face value shown by this schedule should be accepted as shown.

These principles apply equally well for insurance regulation under either "Standard" or "Valued" forms of policy.

In regard to customer's patterns, unless there is a special clause in the policy whereby the insurance company agrees to cover and include in its risk "the patterns held by the assured, the property of others for which the assured may be responsible," the customer's claims will not be recognized by the insurance company. The insurance company insures the owner of the goods and not the goods, hence the question of ownership is of vital importance in the settlement of a loss. No one can insure that which he does not own or for which he is not responsible.

If a customer sends his patterns to a foundry to be used for making castings and there is no specific guarantee given by the foundry assuring responsibility for such patterns, the foundry does not become liable for the loss in case of fire. The insurance companies hold that you cannot make a contract for them and they do not agree to insure the customer's patterns unless there has been a special arrangement assuming the responsibility for such patterns, and the policy issued to the foundryman does not accordingly cover the property. The law holds that where the property is held for the benefit of both baylor and baylee, or, in other words, customer and foundryman, it is reasonable to expect ordinary care from a man of ordinary prudence. If upon the request of the baylor or customer for his property, the foundryman states that he cannot make delivery of the property as it was destroyed by fire, then to recover it will be necessary to show that such fire was due to the foundryman's negligence. The burden of the proof is on the customer to show that it was due to negligence on the part of the foundryman before the responsibility can be fixed. The various legal quicksands in the question of protecting the customer's patterns make it advisable to have the customer insure his property in his own name, distinct and clear from the insurance policy taken out by the foundry. By the customer taking out a policy for the patterns in his own name, all questions as to the title of his property would be carefully defined and he would not run the risks of the foundry failing to come under the average clause. The customer can insure his patterns to their full value and the insurance companies would, under the circumstances, accept the risk without including insurance on other property, thereby in case of loss the customer is in a much better position for readily adjusting his claims.

The customer's patterns when held by the foundryman are similar as a fire risk to the conditions under which the marine policy serves. They are held by, and subject to, the control of others and the policy should have valued schedule attached, as all the patterns sent to a foundry for use must be considered "active" and of value equal to the cost of replacing.

The transfer of patterns via railroad or other common carriers need not involve the question of fire insurance, as it is a part of the duty of the common carrier to assume this risk for the owner. When the shipment is accepted in good order the transportation company agrees for a consideration to deliver the goods in like condition at a stipulated point of delivery.

The insurance companies generally admit that in case of destruction of patterns by fire they have no fixed basis of adjustment of a loss nor method of charging off for depreciation. They proceed to make settlement upon the most equitable basis between the assured and themselves. It would be of great advantage if an established basis of valuation could be predetermined by both parties. The foundryman insures according to his ideas of value, frequently the adjuster's deductions in case of loss cut a wide margin from the item in policy, covering patterns. The amount of premium which the foundryman has been paying based upon his valuation has been probably duplicated for many years.

An established system of valuation would have saved this excessive outlay. The insurance companies having received more premium than actually due them through such over-valuation. The opinions expressed by a number of influential insurance officials indicate that the underwriters would co-operate in formulating and adopting some fair and equitable basis for appraising the value of patterns. Such valuation to hold good in the adjustment of claims for loss.

It is the object of this paper to bring before the members of this association the advisability of adopting rules, governing questions of insurance. It is within the province of this association to establish trade regulations defining clearly what should be considered as active, semi-active emergency and obsolete patterns; also to determine what would be the reasonable amount to charge off for depreciation on patterns under certain classifications and to define the trade meaning of the term "obsolete" as applied to patterns, also decide if it is the duty of the foundryman to insure customer's patterns. Rules governing these points, if recognized by the American Foundrymen's Association, would be legally construed as a law and usage of the trade, and the insurance policy having pattern clause attached, making valuation of patterns subject to the basis adopted by the American Foundrymen's Association, would be a service to both the underwriter and the assured.

The New York Produce Exchange has fixed rules and regulations governing the many trades carried on by its members and all contracts made by them are subject to such rules. The American Foundrymen's Association can in the same way create system out of chaos. Our members come from all parts of the Union. The scope of the organization is national, and there is no reason why the Foundrymen's contracts cannot be drawn subject to the rules and regulations of the American Foundrymen's Association, and thereby establish a uniform basis of business relations which experience has proven to be so beneficial to the members of other organizations.

Echoes From the Oil Country.

STEEL SHARPS.

"This is Mr. Osborne, the general manager of the works here, I believe. I have often heard of you, and it gives me pleasure to meet and shake the hand of an honest man and a thorough, all-round mechanic. I know you are not one of those adjective slaves the monopolies can twist around their fingers or buy off for a song. We have to stick up for our rights, or our children will be worse off than we are; as much so as we are worse off than our fathers."

No, this was not a writer for one of those trade journals, looking around for nice photographs to show at so much a show, nor really an anarchist either, but a sturdy looking man in working clothes. Now, whenever a man opens up on me in that style I know I am in for it in some way, and, while I would like to believe all those pretty things, I have been hit so often on the bump of conceit that I have learned that one might just as well know what is coming, so I let him continue, with a mental reservation on my part.

"Of course you know just as well as I do that the carbon that steel makers put in their steel nowadays is poor stuff, not fit to put into anything. They don't want to sell you good steel. It wouldn't wear out fast enough; and then they are all connected together, those big guns, so the big concerns get the good steel, while the little ones get the poor. It is just a regular put-up job to kill competition and make the little shops close up."

Did you ever hear a gatling gun work? I never did, but in fancy I have pictured its action, and those other automatic fellows, too, where the crank doesn't even have to be turned; you have only to pull the trigger and away they go.

Well, this fellow was one step in advance of that even, and all that was needed for him was a target, and I evidently answered all requirements, and the action seemed to be strictly automatic.

"Now, while I live I am just going to

spend my time helping the working man. I have been offered hundreds of dollars to give this up and work for them adjective monopolies. I did work for them, and I know all their ways, and they know it. Why, they will charge you 12 cents for steel, while I can take a railroad spike and make it cut theirs all to pieces. I would rather take a railroad spike than their steel, because I have to burn all the carbon out of theirs and then put in some good before it is fit to use, while I only have to put it into a railroad spike, and don't have the taking out to do."

I mildly suggested that we were poor, the times hard and collections slow, and I was afraid we did not know enough to go into the steel business; that while I could realize the value of all this, if true, yet, for financial reasons, I believed it necessary to stay on the outside.

This I was assured it was entirely unnecessary to do, as, owing to his hatred to the grinding monopolies, his inbred love of the down-trodden workingman, his faith in the push and energy of the small shop, and his delight in finding a man who showed by the way he ran his shop that he was up to the times (he had been in the shop nearly ten minutes) and by his conversation that he was well versed in all the intricacies (I had only been able to shove in a few remarks edgeways), he had made up his mind that he would leave his secret with me.

"You know, of course, all about steel making, and how that carbon is everything; but still I stand ready to make the demonstration to your satisfaction, and I will only ask you to believe what you see. I have received some very good prices for the secret, but you shall have it for three dollars, which will just about pay for getting the dirt off after making the demonstration. I like you for being honest about being a little hard up, and I will let you have it for a dollar if you say so. I would give it to you for nothing, but a man gives away his luck that does that."

Not to be entirely outdone, I hunted up an old chisel, and at the same time a piece of soft steel that we had taken for tool steel until we tried to work it one day, and then I went with my visitor out to the blacksmith shop and asked the blacksmith to let him use the fire for a short time.

As some of my friends may want to be let in on this, I will tell what I know of the secret process. First, the steel was heated up some hotter than we like; it was then rolled in some white powder that he furnished, and which was the pure carbon, then dipped quickly into some oil, which I had furnished. This put in the balance of the pure carbon, and it could be any kind of oil. The steel was then reheated and drawn into a very stubby chisel that would be hard to break with any kind of use, and tempered and handed to me to try.

I questioned him some as to the action, and I had the story of the railroad spike rehearsed again, and was assured that steel without carbon, if it could be had, was just the thing.

I then took my piece of soft steel and asked him to watch me and see if I understood things right, and I went through the same process, drawing the piece out thin and heating and dipping as for tempering and leaving it hard. I found it would bend across the anvil without breaking, and that unless the carbon went in faster than that it was cheaper to have the makers put it in.

The opinion my visitor expressed of me after this I think can be safely left to the imagination. He had supposed I was using tool steel. The specimen I have given of his flow of language will be enough to show that it did not lack in quantity or variety, but I still had the dollar. Our blacksmith says the powder used was marble dust. The oil was petroleum, B. S., which most people in the oil country are well acquainted with.

There is another "trade secret" that has been worked with more or less success, which still may be new to some. I saw our blacksmith give a demonstration of it. Some of the shops were said to have bought the secret, and it was offered to him, but he declined to invest. This consisted of a wonderful powder that would restore burnt steel, and indeed make it better than it was at first. To show what the powder will do, an old file is generally taken, as it is easy to get and of little value. The end is heated until it is melting; it is then dipped and broken and the coarse grain revealed. It is then reheated, rolled in the wonderful restorative, hammered smartly, both face and sides, *to drive the virtues in*, until it is as cool as it is safe to work it, heated to a proper hardening heat and dipped. Breaking shows a nice fine grain that *of course* proves the claims made for the powder.

Our blacksmith would heat the file to melting in the approved way, cool and break off his specimen, reheat, give a quick thrust into the water tub, then work it on the anvil, as is done with the powder demonstration. Hardening and breaking in the same way show the same fine grain that the other way did, and seem to shake faith in the powder.

I believe all practical mechanics, even after years of theoretical study, feel more confidence in their facts than they do in their ability to lay their hands on all the whys that produced the facts, and so are likely to class the ability to produce certain desired results above the ability to tell what should happen *if* certain conditions should exist, without the ability to tell the conditions when seen.

We are still following the advice of such people as Parke Bros. & Co. and the Crescent Steel Company in working steel, and we try to heat evenly and not too hot, and work well and temper at as low a heat as possible, and so contrive to do without the powder. W. Osborne.

Indicators for Gas Engines.

The ordinary Watt indicator has been used to measure pressure in the cylinders of gas engines during isolated explosions, but the variable nature of the explosive mixture renders the diagrams that are thus taken unsatisfactory to judge the operation of the engine by. As applied to automobile motors there is the further trouble that the rapidity of the ignitions renders it difficult to take the cards.

An attachment by which the indicator can be used to give a continuous diagram of successive explosions has been devised by R. Mathot and is described in the "Revue Industrielle," Paris. It consists of an auxiliary drum pivoted to the frame of the indicator and slowly rotated by clockwork. It registers both the number and the force of the explosions, which are denoted by the long ordinates in the cards, the short ordinates representing miss-fires. The card shows also the initial pressures.

With diagrams obtained in this manner it is possible to detect the influence of such factors as the section of the gas conduits and ports, and the sensibility of the indicator, the value of the explosive mixture and the best time for ignition.

The diagrams shown in Figs. 2, 3 and 4 were taken upon different engines and correspond to a complete turn of the drum, which occupied about two minutes. Fig. 2 denotes that the gas pipes were too small, so that the explosions failed to attain their maximum power without a gradual decrease of speed. Figs. 3 and 4 each include two parts, the left-hand curves showing certain defects and the right-hand the results of remedying them. The trouble in Fig. 3 was a too small gas pipe. In Fig. 4 the engine was running with half-charge and the exhaust pipe was too long, so that the motor retained an objectionable quantity of the products of combustion. Other diagrams which are not reproduced cast light on the influence of the sort of ignition tubes used, the combustibility of the mixture, the effect of clearing out the burnt gases, etc.

The same inventor has devised a special indicator for automobile motors, adapted to any speed. In this the paper is fed continuously from one cylinder to another, the pencil resting against a third cylinder over which the paper passes. There is an auxiliary pencil to trace the line of atmospheric pressure. In taking the diagrams the speed of the paper is so regulated that the ordinates representing the explosions are distinct one from another. By using a sensitive spring it is possible to detect the consequences of resistance to the inflow of gas as well as to the exhaust and draw useful lessons therefrom.

These indicators are being constructed by Paul Garnier, a watchmaker, presumably of Paris.

Thin Brass Castings.

BY C. VICKERS.

Under this head the writer classifies all brass work from one-half to one-sixteenth of an inch in thickness. The difficulties that beset the molder on thin work are: Scabbing or cutting, causing dirty castings; blowing, when a hard or wet spot in the mold prevents the metal running and squeezing down, which shuts off a portion of the casting completely. Pouring too cool and pouring too slow are also fruitful causes of failure in thin work.

On a plate ½ inch in thickness, and say 26x18 inches, the chief cause of failure, with the ordinary fine sand used by brass founders, is scabbing. This generally occurs on the nowel side of the casting in the direct path of the metal, and is caused by hard ramming or using metal too hot. A casting of this thickness can be poured cool. The gates should be broad and thin, the metal skimmed clean, started into the mold in a moderate stream, and immediately increased so as to to fill up the head of runner, which must be kept full until the mold is filled. If this is not done, although the mold may not scab, the casting will probably be dirty.

When ramming this mold the nowel is the part where the most care must be taken. The molder must regulate his use of the rammer by the depth of sand over the pattern. The pene should never be used over the same. A nowel 2½ inches in depth is quite deep enough for this work. The sand should be well tucked around the pattern, the pene being used all around the edges to give a good firm joint, and the ramming finished by going over it once and lightly with the butt rammer. After bedding on the bottom board a thin vent wire can be used with advantage.

No especial precautions are necessary with the cope, the danger of scabbing being much less on cope than nowel. The sand must be rammed sufficiently hard to withstand handling without "dropping out." It must be well packed under the bars and vented to carry off the gases, and after lifting off look for hard, soft or wet spots over the bars. These should be dug out and filled in and the whole slicked over with the trowel.

There is very little danger of blowing with a mold rammed as above, but it may be "squeezed down." While this will never proceed so far as to shut off a portion of the casting it may give it an uneven thickness or crush in the sides; indeed, these two defects would likely go together. Another danger from squeezing is the dropping of a portion of the cope after closing and when clamping or weighting. A fruitful cause of this trouble, especially with wooden flasks, is an ill-fitting cope—a rocking cope should never be rammed up. When clamps are to be used on such a mold they should be tightened on before ramming the cope; or, if weights are used, the cope must be straightened. If this is not possible, the rocking corners should be blocked up with wedges which may be carefully tapped to place after closing and before weighting the mold.

When we come to thinner work, say ⅛ inch in thickness, squeezing is the most formidable enemy we have to contend against. Not that a casting of this thickness will not scab; it will, but not quite as readily as the one just considered. The remarks on soft ramming of nowel apply just as much to this as the heavier casting, but if followed venting of nowel is scarcely necessary. Blowing is, however, a thing to be considered, as it will cause holes in so light a casting. Too wet sand may be the cause, so while, to use a molders' expression, the sand need not be "as dry as powder," it should not be too wet.

A casting ⅛ inch in thickness will not need the metal "jumping hot." A bright cherry is the right heat, and it should be poured rapidly. A casting 10 inches wide, 18 inches long and ⅛ inch thick, inclined 3 inches from the pouring head will run easily with one pot, if proper precautions are taken to prevent squeezing.

In laundry machinery we often find examples of this class of work; coin operated machines also use thin brass castings. Generally these are small, but occasionally plates, about 10 by 14 inches square and less than ⅛ inch thick, are needed, which are furnished with numerous slots, holes, pins, lugs and grooves. The pins, lugs and grooves merely require a proper lifting of cope and drawing of pattern, but the holes have to be clear and free from burrs and strain. These plates are made in the ordinary iron flasks, and it is desirable to use both top and bottom boards. The bottom boards must be solidly bedded; the top board should be a good one, and the manner of bedding on is important. After the cope is rammed and struck off a very

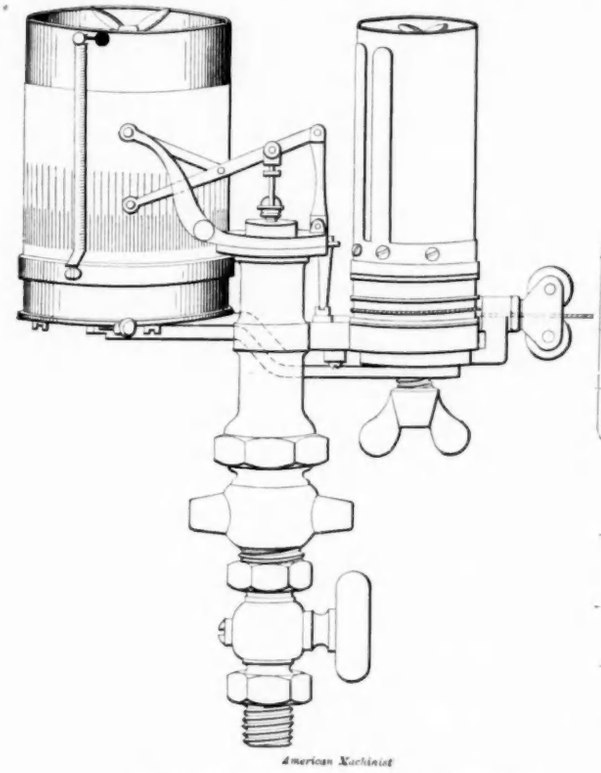


FIG. 1. INDICATOR ADAPTED TO A GAS ENGINE.

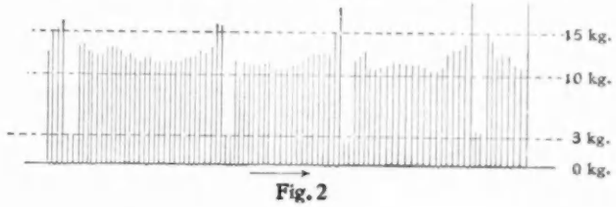


Fig. 2

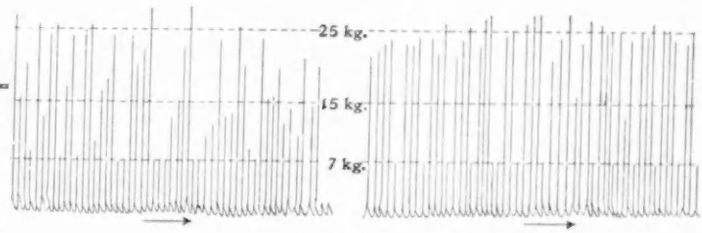


Fig. 3

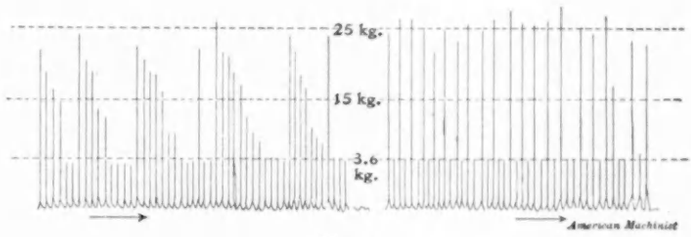


Fig. 4

GAS ENGINE INDICATOR CARDS.

little sand should be thrown over, and the board be scrubbed down until it has a solid bearing on both the sand and the upper edges of the flask. Sufficient weights must be placed on the molds, when pouring, to hold them down without aid from the foot; otherwise, on removing the foot to place on the next mold, the metal may flash and film the holes, without any visible sinking of the head. It is possible to spoil an entire heat in this manner.

Castings thinner than those we have been considering rarely scab; squeezing and pouring too cold or too slow are the things to be guarded against. Work 1-16 inch in thickness must be poured as hot as possible. The metal must reach the boiling point, and be, as the furnaceman would say, "jumping hot" before it is removed from the furnace, and the work of skimming and carrying to the molds must be done as rapidly as possible. Some molders are more successful in running such work than others, being less nervous.

Sometimes first-class men are failures on such work. They know how it should be done, but for the life of them they cannot do it. After pouring one or two molds they become nervous, hesitate at the critical moment and make work for the furnaceman, to their own utter disgust. The pouring of such work must be done rapidly, the metal being shifted from mold to mold as quickly as possible. The spout of the pot is rested squarely in front of each runner head and the metal unhesitatingly tipped in, thus instantly filling the mold.

When small light castings are to be cast in the same flask with other work of a heavier character, the light pieces should be placed at the bottom end and in such a manner that the metal will have a straight run into them. Such things as name plates thus run much better when placed squarely across the lower end of mold, at the bottom of main runner. If placed at the side of the same, their gates form a right angle with the runner, the force of the metal is checked and the chance of loss greatly increased.

An Improved Speed Controller.

The general device here shown was fully described and illustrated in our issue of August 2, 1900. The present article has to do with an important improvement in the application of it. This speed varying device has been successfully applied to electrically driven organ blowers, one of which is shown in the half-tone, the motor being at the right and the speed varying device at the left, the power being transmitted to the blower by the vertical shaft. The head and bracket which carry this shaft may be taken off and turned, so that the shaft may lead off horizontally instead of vertically, if so required. The speed of the motor being constant, the driven speed is varied by the small horizontal rod inserted in the shaft of one of the quadrants, the moving of this of course moving both quadrants and also changing the angles of the transmitting friction rollers within. This rod may be connected with the wind box of the organ so that the speed will automatically change as required by the fluctuations of the air pressure. The advantage of this arrangement over the control of the speed by rheostats is that a great saving of power is effected and also that the changes of speed are gradual throughout, and not step by step, with neither step giving precisely the speed required.

Fig. 2, which has nothing to do with Fig. 1 and does not show the parts in corresponding position, will clearly show the operation of the device, with the improvement in its application. In this case the pulley *A* keyed to shaft *B* by a "Woodruff" key, is the driver. On the inner end of this shaft is keyed the friction wheel *C*. Opposite this is the corresponding friction wheel *D*, keyed to the driven shaft *E*. Motion is transmitted from *C* to *D* by the intermediate friction rollers *F*, and in the position in which they are shown friction wheel *D* will rotate at the same speed as *C* and in the opposite direction. If, however, the rollers *F* are turned to the position indicated by the dotted lines, the speed of *D* will evidently be much greater than the speed of *C*, and by changing the positions of the rollers *F* the speed is controlled.

Not only speed is to be considered, but also the necessary pressure upon the rollers *F* between the friction wheels to ensure reliable transmission of all the power required. It will be noticed that there is a collar behind wheel *C* to take the thrust, so that its position and that of its shaft *B* do not change in the direction of the axis, but wheel *D* and its shaft *E* have no restraint upon their axial movement except what is given by the thrust spring *I* at the end. This spring is pressed by the screw plug *H*, and this is adjusted to cause only a slight pressure of friction wheel *D* against the rollers *F*. All the parts turn in the direction indicated by their respective arrows. The power transmitted is all received finally by the worm wheel *K*, and delivered by its shaft to do the work required. The effort to turn this worm wheel becomes an axial thrust in the worm *J* and its shaft *E*, and all the resistance to rotation of the worm wheel *K* thus tends to move shaft *E* to the right, or to press the friction wheel *D* more heavily against the rollers *F*. The amount of pressure upon these rollers therefore depends upon the power transmitted, and is accurately and automatically adjusted thereto without any pressure and consequent friction in excess of what is required. The device as here described is made by the L. E. Rhodes Company, Hartford, Conn. It is of course applicable to many lines of service.

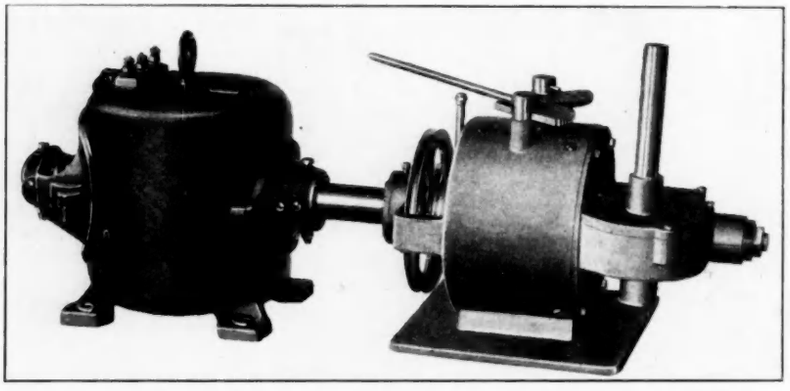


FIG. 1. ELECTRIC DRIVE FOR ORGAN BLOWER WITH AUTOMATIC SPEED CONTROLLER.

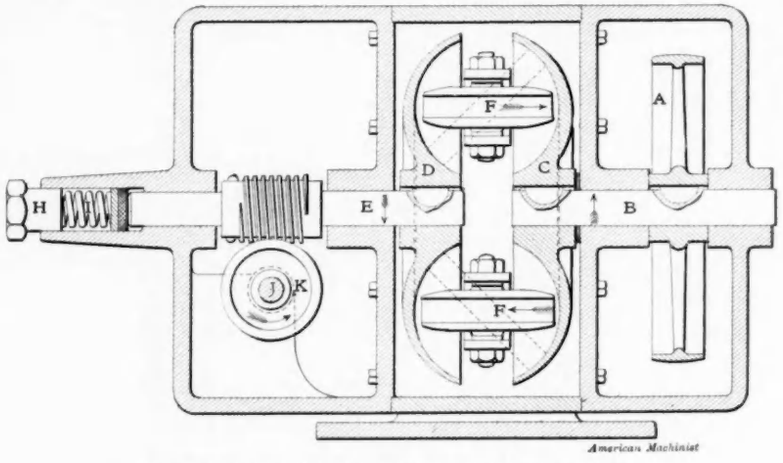


FIG. 2. SELF-ADJUSTING THRUST OF FRICTION WHEELS.

Letters from Practical Men

The Importance of Little Things in Drawings.

Editor American Machinist:

Mr. Osborne's letter in the "American Machinist" No. 28 set me to thinking how necessary it is for the draftsman to be correct to the minutest detail. I have yet to find the average machinist who will add up a series of dimensions to get the required one. Rather than do that, many of them will scale their blueprints and when held to account for a mistake will excuse themselves on the ground that it was not on the drawing and no amount of argument will convince them to the contrary.

The draftsman will claim that he didn't make a mistake and of course he did not, but nevertheless he is more or less to blame for making an omission, although I find that it is almost impossible not to leave out something once in a while. No matter how carefully we plan the method of doing the work and seemingly put on all required dimensions the machinist will invariably do it by a different method and as a result will sooner or later bring up against some missing dimension.

There is a certain class of drawings, in which great accuracy is not required, and upon which dimensions, except as to size of stock, etc., are useless. For instance, a piece made out of sheet stock bent to a particular shape, if there is no former for the work will be bent until it fits the blueprint. This gives the workman a *lame* excuse for scaling some other part of the drawing, which, it may be self-evident, should not be scaled. Quite recently we had the case come up of a roll which revolved in bearings at the ends and fitted so tight between the shoulders that it would not turn freely. The inspector ordered it corrected and the workman excused himself on the ground that it was made to figures and claimed that the drawing should have been marked "a running fit," although he had made them correctly for years.

I remember another case of a pulley. After several lots had been made and passed by the inspector, a lot was made having no crown on the face. Upon referring to the drawing it was found that it was not shown crowning and thus the draftsman had to take the blame.

The other day we wanted a casting of a small crooked lever as soon as possible. A drawing was hastily made and taken to the pattern shop with instructions to get it into the sand the same day without fail. It was brought into the drafting room at the last minute, where it was immediately discovered that it was made wrong side up. The patternmaker, forgetting that we make all drawings in the third angle, excused himself on the ground that two short lines showing where the arm and hub joined and which should have been either omitted entirely or drawn dotted where shown full.

I could name many similar cases, but these will serve to show what a little thing will make an endless amount of trouble for the draftsman, and how easy anyone can shift the responsibility of a blunder on to the drafting room.

FRED S. ENGLISH.

Workmen should not be required to add dimensions to get those needed. The omission of over-all dimensions is a draftsman's error, albeit one of omission instead of commission. More draftsmen fail to produce satisfactory drawings because of their inability to properly figure them than from any other one cause. Correct dimensioning is, next to accuracy, the most important feature of a good drawing and the beginner has usually more to learn about the apparently simple art of figuring his drawings than about any other one thing.—Ed.

Set-Screw Experience.

Editor American Machinist:

The letter of A. Sangster in issue No. 24, page 672, giving his experience with set-screws and his verdict against cup points and preference for round points calls me out. My preference, for most of the places where a set-screw seems to be the handiest and best fastener, is for flat points. I use them in my practice as tool-post screws, in all lathe dogs, in all drill chucks for holding drills, in pulleys and everywhere that I can make a flat place for the end of the screw, on the thing to be driven, or to drive, as the case may be. I have no trouble with drills getting loose in chucks, or chucks in the drill press or the lathe when fastened that way, and still they seem to come loose easily when I want them loose. It is the same way with a pulley, if the screw is of a proper size. With a flat place on the shaft somewhat wider than the screw point it will do the work without marring the shaft, and if it should be wanted off it can be got off.

The elder George Westinghouse years ago used on his farm machinery for fastening things to shafts round point screws and he milled round bottom grooves in the shafts somewhat wider and deeper than the diameter of the screw points, which was good practice, as much of the work needed frequent removal or change and was easily got off. Many narrow faced pulleys have the set-screws put in on a slant drilling the holes from the outside of the rims instead of through them and in that case the round point screw is the best, and a round bottomed place in the shaft is what is called for. The getting of things off is a problem we must not ignore if we care for the other fellow, and even for our own comfort. And a set-screw that slips, and cuts or swages a ring around a shaft, is an abomination; and when the thing which was supposed to have been fastened has to be taken off, then the second act is before the audience. I dare say the majority of us have had our trials with such cases, and have perplexed our minds and perhaps pounded or pinched our fingers and felt all sorts of ways toward the combination that produced such results.

The set-screw is a handy thing. With a supply of different sizes and lengths in stock, and with good drills and taps to work with a pulley or collar can be fastened on a shaft in a short time—that is, if set-screws will fasten it. I have had opportunities to find out about all there is to know of set-screws as fasteners. In a machine shop or factory, for driving the usual line of machinery there is nothing more convenient or better; but in a sawmill or tannery, or with the usual line of agricultural machines, they will not do the business. Some sawmill makers began by using screws to hold the driving pulleys on the saw arbors, but they soon learned that the time-proven key and seat were the best and only sure fasteners.

I know of one mill that ran several months by the friction of two ¾-inch set-screws in the 24x12-inch pulley that drove the saw. One day it slipped and wrung the shaft so that it seemed impossible to get it off without a surgical operation. As the parties were driven with work, I drilled the shaft for the points of the screws to set in, and the points, which were hardened, broke off and let the pulley run loose again, when I drilled and put in larger screws and bedded the points as before, with the result that both screws broke a distance from the shaft in the pulley hub. The parties ran the mill until those pieces of screws gradually turned over in the soft iron of the pulley hub, and the pulley got to clattering so that the surgical operation had only been deferred. It was performed by chipping in from the end of the hub and getting the pieces out, and then fastening a piece of steel in the slot; I managed to turn the rings off the shaft and got it off. It was not so far gone but that there was a place for a key seat, and it got it.

It would be tedious to tell of the different things supposed to have been fastened by set-screws that come to my shop for repairs—things that are loose on shafts and can't be made to hold nor got off. There is much of it that is intended to be good work, and considered good practice, but the parties who made it never suspected the demand that would be put on it when called into service, and as set-screws are cheap and easily applied they are altogether too much used. Much of this machinery gets all sorts of use from all sorts of men, and the murderous set-screw has unlimited opportunity. On much of it the cup-point screw is used, which is a good screw for a set-collar but a terrible ringer in pulleys. I find them with the thin edges of the cup broken off and the hard fragments in various places on the shaft. If they fasten at all it is by their

first and final effort; no amount of labor will get them to bite when their one tooth is gone. I dare say that set-screws would fasten almost anything to a shaft if screws enough were put in, but in the usual practice two are considered the maximum number. If the 24x12-inch pulley above mentioned had had six or eight the result would have been better, but the cost would have equalled the cost of a key and keyseats.

There is another fastener much in use, aside from set-screws and keys, and that is pins through both hub and shaft, and from what I see of them they are little, if any, better than the set-screw. I find them in different machines; conspicuously in mowing machines, where several pieces go on one straight shaft, with holes all one size and a slipping fit. The jar of the work soon makes a loose fit, and then the pins are broken or sheared off, and the pieces are not easy to get out.

What a valuable lot of experience men who think they are doing good work would get if they had to follow a few of their own make of machines. I am sure the fresh output would have many sensible improvements, for I can but think that the majority of manufacturers are doing the best they know. F. P. AVERY.

Tunkhannock, Pa.

Some Points in Drawing Room Practice.

Editor American Machinist:

I enclose blueprint of a couple of scales which we use in our drafting office. These are thicker than the regular scales, and do not warp appreciably. The white celluloid makes them easier to read than wooden or steel scales. The 8-inch size is long enough for our detail drawings and is much handier than a 12-inch scale. Two graduations seem quite enough on a scale that is used constantly. These scales are made to order for us by the Keuffel & Esser Company, New York. The draftsman's name is stamped on during manufacture.

Some would consider the 2-inch per foot to be odd scales, but they come naturally in the list, ¼ ⅓, ¼, ⅛ , and ⅛ full size. The 2½ per foot scale that Mr. Pilton mentions is not an even division, though it comes near being ⅕ size. Right here I would like to ask if someone will tell us what scales are used for machine drawings made to metric measurements.

SIZES OF DRAWINGS.

We have two standard sizes, the old standard, 25½x36 inches, which was formerly used for all our drawings, and a new standard 12x18 inches. The latter we call quarter sheets and we put a Q before the drawing number. This 12x18 inch sheet is small enough to be conveniently handled in drafting room or shop, and is large enough to take almost any detail without crowding. In the case of large or intricate castings such as main frames and steam cylinders which would be too crowded on a 12x18 inch sheet, we make two drawings, one for the pattern-maker on a large sheet, putting in all dimensions, and one or more for the machine shop, on small sheets, just a bare outline with dimensions required for machining only. The drawing for the pattern shop is a partly assembled view showing, in the case of a steam cylinder, the heads, steam-chest cover, glands, piston, bagging, etc., in place. The machine shop drawings of the same parts show each one separately.

A complete set of these 12x18 inch prints for one machine is made up into a book, being bound with paper fasteners. A cover is blueprinted and on it is marked the size and class of the machine and the consecutive shop number. This book is handed to the general foreman of the department constructing those machines. The greater number of our machines are of a type which admits of so many combinations for each nominal size that it is a great advantage to the foreman to have a set of the drawings on his desk. The foreman notes any changes from dimensions given on drawings (on account of castings not cleaning up, etc.), and the book of prints is afterwards filed for reference.

TITLES OF DRAWINGS.

Our little card goes in the lower right-hand corner, where it can be readily seen upon opening the drawer of tracings or in turning over the leaves of a book of prints. I enclose a corner of a blueprint showing title.

ERASING FROM TRACINGS.

I can vouch for the good work Mr. Terry can do, both in putting lines on tracings and in taking them off, but since I came away out of reach of Mr. Terry's instruction I have stopped drawing on the glossy side of tracing linen. When one draws on the dull side it is not necessary to take so much trouble in making erasures. It is a little harder, it is true, to make extensive erasures, but the majority of changes on tracings are changes in figures, and it is quite a bother to use pumice and chamois to put the gloss back on a little spot in the middle of a drawing.

In reference to this matter of making changes in figures. When the figured size is changed sufficiently to make an appreciable discrepancy between it and the scaled size, we put the word "mark" after the figures. This shows that there is such a discrepancy and that the figures are correct; it saves trouble.

We adopted the plan from the drawings sent here from our American shops, but I have never seen anything similar on any other blueprints. H. V. HAIGHT.

Sherbrooke.

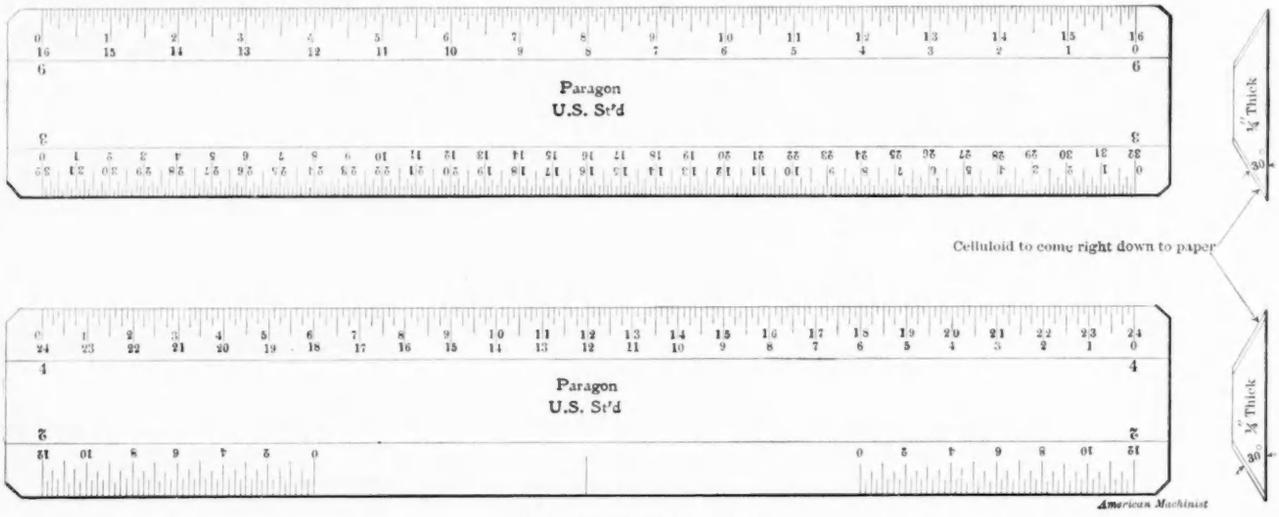


FIG. 1. DRAFTSMAN'S SCALES.

A Link Planing Rig.

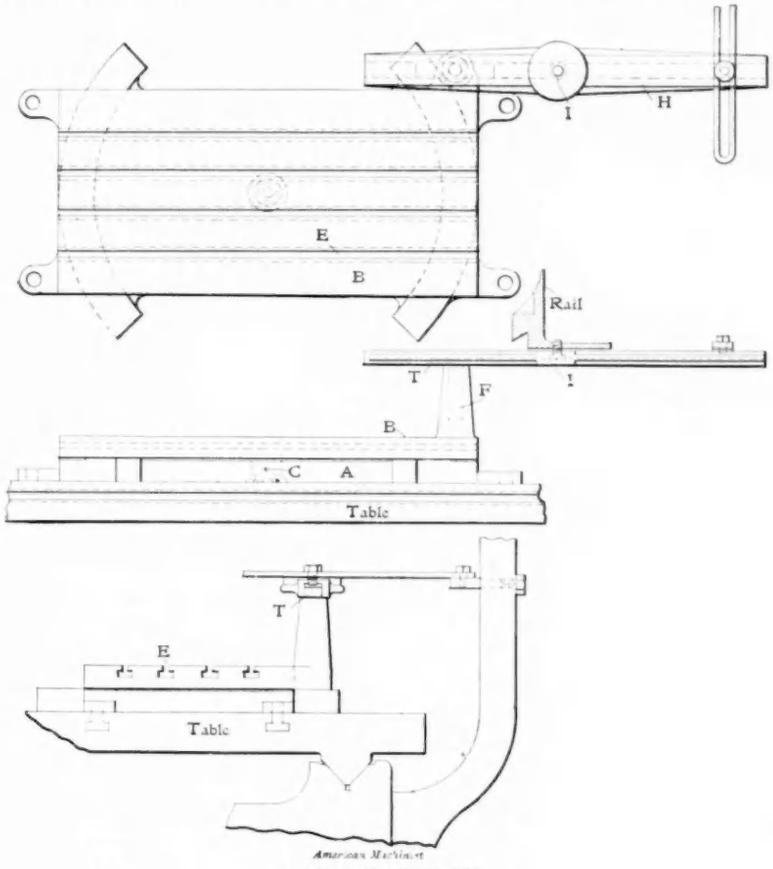
Editor American Machinist:

In your issue of June 13 appears, over the signature of Nicholas B. Miller, an article describing a link planing fixture, and although it may be new to him, if

he will look in the advertising columns of the "American Machinist" of May 30, 1901, he will find illustrated a fixture "for planing curves of any radius," which is manufactured by an Eastern firm.

I have used a link planing device which had been in use in the shop for a time beginning before 1893.

In reference to the article of Mr. Miller, where he uses an independent clamping device to be attached to the rail of the planer, on which is mounted the guide or grooved rail for rotating the table, we attached this directly to the rail itself by one central screw, countersunk head, at the place marked *I* in his drawing. Instead of the roller *G* was a T-head or guide sliding in the grooved rail, having



A LINK PLANING RIG.

a working fit in *F*, the post in the corner of *B* or the upper oscillating plate. The central pivot *C* was a stud cast on plate *B*, which fitted the base in plate *A* which was countersunk on the under side, the stud *C* being shorter by the thickness of a washer or collar. This collar was fastened to stud *C* by four screws, allowing plate *B* to rotate freely on plate *A*. The slots *E* were lengthwise instead of crosswise of the plate *B*, and four in number. This left the top of the plate plain over the center of stud *C* to allow center lines for settling work. In setting the guide for *H* on the cross rail at *I*, the rear end is held by a slotted bar or link, an end attached to the housing of the planer, and the guide for *H* attached to it at the angle required. The slots *E* can be placed in any way that suits the builder, but I think that the best practice would be as indicated by the sketch herewith and that a sliding guide is better than a roller at *G*.

E. W. BRADLEY.

Cleveland, Ohio.

Quicker and Cheaper Jig Work.

Editor American Machinist:

I would like to tell the readers of the "American Machinist' of another method of proceeding with the jig illustrated by Mr. Joseph V. Woodworth on page 810. I can see no reason why the bushing holes could not have been bored ready for the bushings in the same time and in the same manner that the master templet was, measurements being made with a hight gage and vernier, thus doing away with the templet in making the jig, also the extra time it took to make the special drill, drilling and reaming the four holes, making a ground button, and last but not least indicating the holes true and boring them. Besides, transferred holes, though ever so carefully done, are quite as likely to be unsatisfactory as otherwise where accurate work is required. Assuming that the indicator work done in the lathe was perfect—that is, that the bored hole followed perfectly the reamed hole—there are still two chances in the drilling and reaming for the holes in the jig not being the same as those in the plate; and, besides that, if there had been a blow-hole right where the special drill was going through, where would the nice work on the templet have been? With bushing holes in and plugs in them we could lay out with hight gage and scriber for the four locating pins, driving in pins that would surely be large enough, then, with the jig on parallel strips, measure from the surface plate to the plugs in the bushing holes, and from thence to the pins, ascertaining in this way the exact amount to take from the pins to have them the right distance from the holes. In case a pin was too small, one could be made with a head. "SHORTER."

Cost of Fine Brass Castings.

Editor American Machinist:

There are those who would like to know the cost of producing ornamental brass castings, such as used in the make-up of ornate fixtures for gas and electric light, also for the decoration of furniture, for architectural purposes, etc., including such work as cored hollow arms for leading through the same gas and electric wires, also cored cock barrels and other fixtures. I give below some figures recorded by myself as the cost of production of such castings in the establishment of which I have charge. It includes work from the plainest chain links to the most highly decorated parts, solid or with core, and all of light weight. Considerable work also was made from wax patterns, and this being handled in the hot season was exceedingly difficult.

We melt up, as will be seen, all our own sweeps and turnings. The sweepings have the iron taken out as well as it can be with a horse-shoe magnet, and they are then weighed and charged. The automatic turnings are set aside in barrels with perforated bottoms on top of pans, to allow the oil to drain off. Then when oil is no longer strongly perceptible on the turnings they are weighed and charged against the foundry. The turnings from the turning lathes, with more or less wood turnings, are weighed as swept up and charged. The prices for these sweeps and turnings, as shown in the account below, are the same as the concern received from smelters previous to my taking charge, when all the turnings and sweeps were sold. We have no separators, so that we are considerably hampered in this respect, until one is either purchased or made to do this work. We use Windsor Locks sand. Our spelter, it will be noticed, is not of the dearest quality, but it has given satisfaction, and our product is of good color, taking on an ormolu effect of very satisfactory character, and up to the present we have had no trouble with our cock metal, that might suggest danger from use of turnings.

For the sake of arriving at least approximately near the actual amount of core work, wax pattern work, plain work, etc., turned out, I give as near as possible (having no actual record) by a re-

search of other memoranda, a table of the proportions of work of various character as follows:

Plain castings	.915
Statuary bronze	.025
Core castings	.05
Castings from wax models	.01
Total output	1.00

ONE MONTH'S EXPENSES.

945 lbs. Spinner's Scraps	at .10	$ 94.50
1266 lbs. Floor Sweeps	at .03	37.98
275 lbs. Pipe Scraps	at .10	2.75
240 lbs. Automatic Turnings	at .08¾	21.00
506 lbs. Spelter	at .05	25.30
7 lbs. Phosphor Tin	at .35	2.45
1239 lbs. Copper	at .17⅜	215.28
1 bbl. Charcoal Facings		3.50
6 No. 20 Crucibles		6.60
2 No. 30 Crucibles		3.30
Flour		.99
Charcoal		1.30
Coke		22.60
10% Depreciation on Plant		7.00
Wages for the Month		246.17
Total Expense		$690.72

We turned out in the month 3,990 pounds of castings. Then $690.72 ÷ 3,990 pounds = .173÷; or, approximately, the cost per pound was 17⅓ cents.

I might add here that in the wages charged there is included a day's pay for all hands, which day was spent in moving the foundry to the upper floor and on which day no furnace fire was lit. Chandelier makers of high-class design will ask no doubt how about false core work? This work is at present done in other departments, and therefore is not included in this account. The foundry payroll includes one hand not engaged in molding but who does all the gating of the jobs as they are ordered.

I believe the above will give a fair idea of a low-cost system. A smaller shop not having the scraps and turnings would naturally be unable to turn out the product for so low a price. There is many a small ornamental brass foundry running to-day that is not paying but which is maintained simply because it is convenient to have the foundry near at hand, and while it would be of course preferable to get castings at the lowest figure it is found impossible to get another foundry that will or can be expected to give immediate attention to the orders when wanted; therefore it is more satisfactory to maintain a foundry, though it does not always produce castings as cheap as does a larger foundry. I do not give the above account as an example of cost keeping, but I believe there are points of interest that may be of value and interest to those engaged in ornamental brass casting. I have omitted all reference to rents, general burdens, etc. I do, however, charge $7 monthly for depreciation, and only do this to give an idea of cost of plant.

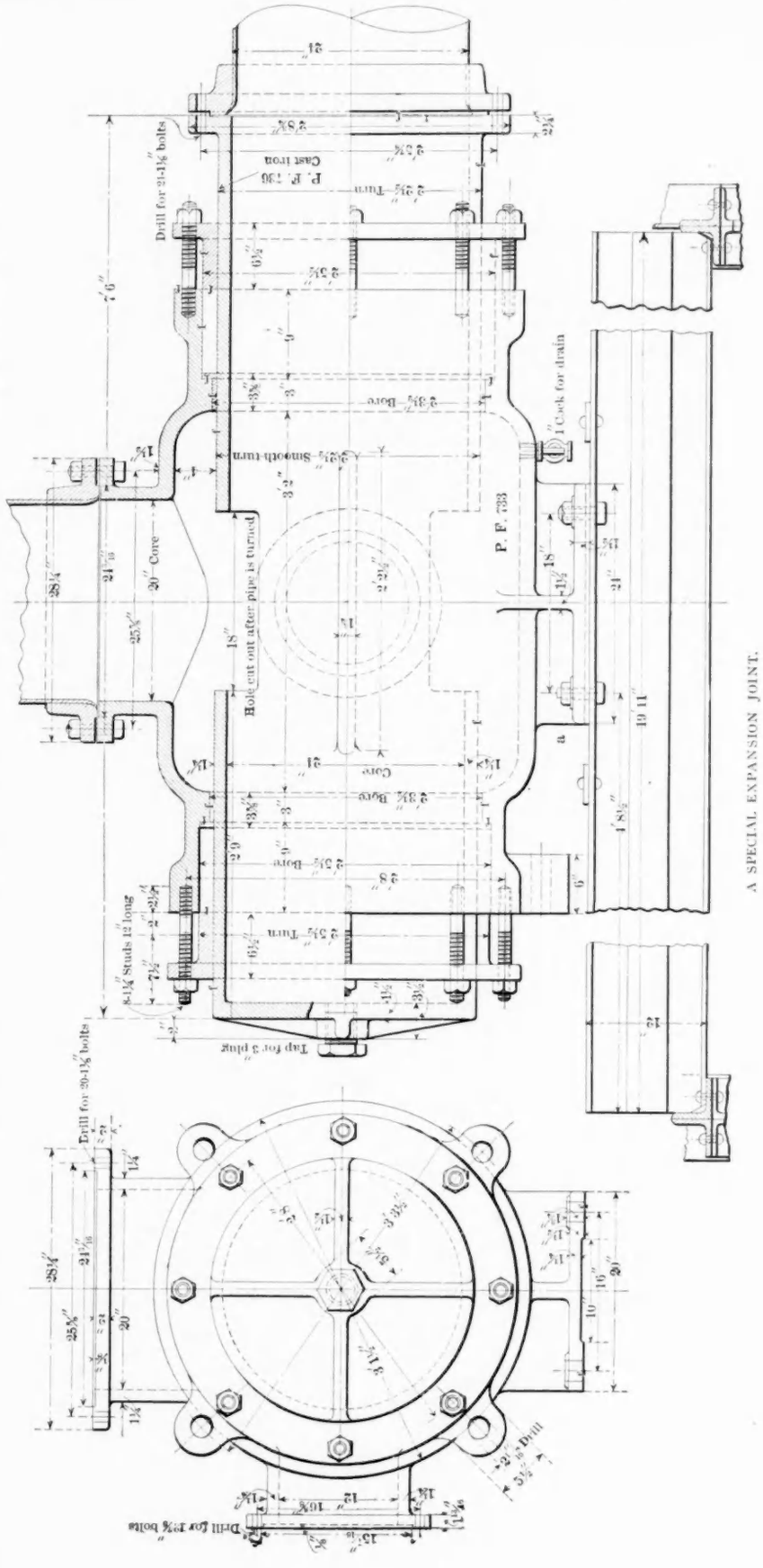
JOHN G. NIEDERER.

East Rutherford, N. J.

A Special Expansion Joint.

Editor American Machinist:

I don't care to set the whole world thinking, but I believe that steam engineers might use a little of their surplus



energy in trying to make a better expansion joint than we now have. We are all familiar with various forms of expansion joints and with ways of getting around the changes of length a steam pipe undergoes when its temperature is changed; but there are so many disadvantages in all methods thus far tried that one often feels that if they are the best that man can do he is not so great after all. However, the problem is not so easy, and when conditions confine us to certain prescribed limits it becomes more difficult.

I don't claim to have solved the problem, but the sketch herewith shows an expansion that gives very good service, notwithstanding the fact that twenty and twelve-inch branches are taken from the main line at the joint. It was necessary that these branches be held stationary so the flange connections were made in the shell of the joint which, in turn, was bolted to a beam as shown. It will be seen that this expansion joint requires two outside packings, but they are little trouble compared with a leaky, *unbalanced* joint that makes one feel like increasing his life insurance when he is compelled to make it his companion. STEAM ENGINEER.

The Average Mechanic's Library.

Editor American Machinist:

Some time ago there was published in a monthly magazine an article entitled "The Average Young Man and His Library." As indicated by the title, the article contained some suggestions regarding the kind of books the average young man would desire to possess and something of the method of acquiring them; a few books purchased from time to time as opportunity presented, and each book creating a desire for others.

It has been my wish since reading that article to ask if someone, through the columns of the "American Machinist," would give some information regarding the average mechanic's library. It seems necessary to-day for men in all branches of the machine trade to devote a great deal of time to study in order to keep up with the procession, and mechanical text books and works of reference should be within the reach of every thinking mechanic. The man in the small city or village, having access to no public reference library for scientific and mechanical information, is thrown upon his own resources, on such books as he possesses or can borrow from his friends.

While the expense of technical books is somewhat greater than the ordinary works of fiction or the general run of literature, it would seem that, with a few dollars now and then and a great deal of consideration before each book is purchased, a first-class working library may be acquired by the average man. Perhaps the number of books need not be large, but each book ought to be full of information, and information given in such a manner that the ordinary man can get hold of every bit of it. And right here I find is one of my greatest troubles. While my library is small—very small indeed—it is growing, and that is encouraging; but each time I have a little money to devote to the purchase of a new book the question arises, What shall it be? or rather Which shall it be? For there are so many books on each and every subject that a man wishes to investigate that it is well nigh impossible at times to make suitable selections.

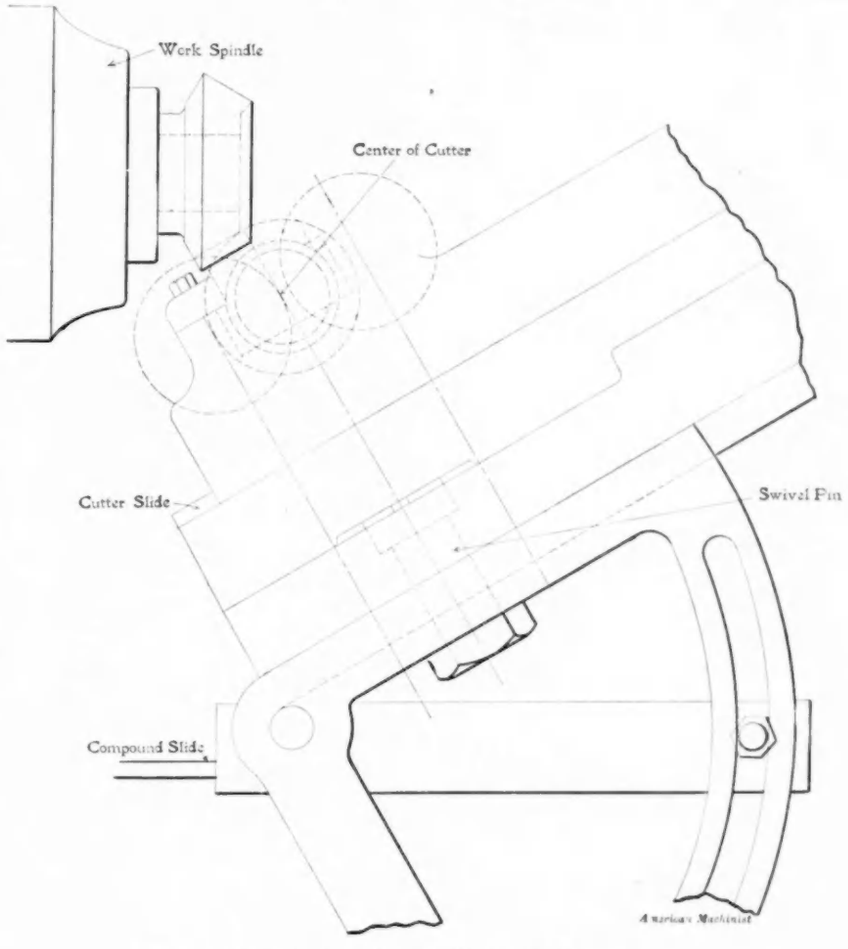
While it is obviously impossible to give a long list of books which shall meet the requirements of every individual reader, I believe that there are certain subjects of interest to all practical mechanics, and I feel that someone who has devoted many years to the various branches of machine work, and who has had opportunities of seeing much of the technical literature published, can tell a great deal about some of the books that would be of the greatest benefit to the practical man in his everyday work. S. F. ARTHUR.

[Our list of Selected Mechanical Books was published with a view to assisting persons situated like Mr. Arthur. It is impossible to select books wisely from their titles alone, and in making up this list our idea was to recommend only such books as our editors knew to be good and at the same time to give such information regarding their general character as would enable buyers to determine if they were suited to their wants. The list may still be had for the asking.—Ed.]

Cutting Bevel Gears.

Editor American Machinist:

I enclose a sketch which I hope may be of use to some of your readers. Having to cut quite a number of small bevel gears, and not having an improved gear planer I experienced quite a little trouble getting all near enough alike to be practicable. There was no provision on our machine for adjusting the cutter spindle accurately after swiveling the table to make the second cut. You will notice from the sketch that the depth of cut can be adjusted in two different ways either by the compound slide or by lowering and raising the work spindle. As only the cutter slide swivels, the compound slide being always straight, it is clear that by getting the center of the swivel-pin and the center of the cutter in line with the face of the work, the swiveling will not widen the cut at the small end of the tooth. It is sometimes necessary to make the cut wider than the cutter, and by moving the cutter center in relation to the face of the cut when the depth is taken, we can get



ADJUSTMENT OF GEAR CUTTER FOR CUTTING LEVEL GEARS.

the required throw, and once getting it right we can swivel the table, which will take care of the width of cut, and by this method it requires very little care to get all the gears alike, or at least near enough for all practical purposes. S.

Lettering Drawings.

Editor American Machinist:

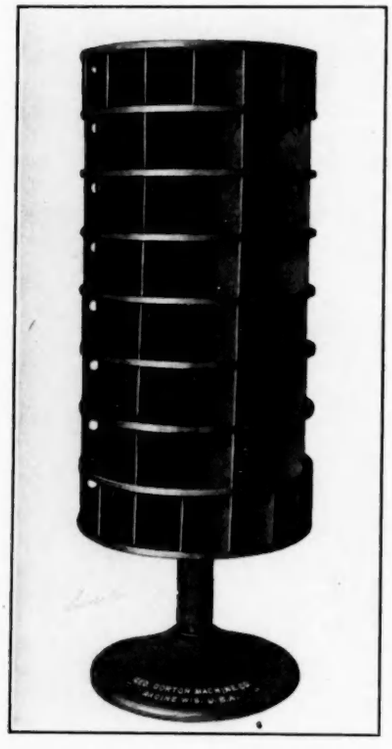
I find that a very convenient and rapid method of lettering drawings, especially where there are bills of material to go on them or much writing explanatory of the work, is to use a typewriter with a black ribbon and plain letters which will print out very well in blueprints. The only objection to this method is that there are but few machines that will take in drawings of any length or that will print on any required line. Anyone having a Hammond, or a machine of the class having open ends, can try the scheme and see how it works.

H. J. BINGHAM.

Some New Things.

On this page will be found engravings of two new revolving racks for shop convenience, recently put on the market by

REVOLVING TOOL HOLDER.



REVOLVING SCREW RACK.

the George Gorton Machine Company, Racine, Wis., which need very little description, as their construction is very plainly shown in the photographic reproductions.

The tool-holder is simply a series of iron shelves which can be adjusted to any desired opening, and which have round corners and fillets—no place to catch dirt.

The other rack is what the Gorton people call a screw rack; this has conical shelves, sloping toward the center, with adjustable partitions. This rack is intended to hold screws, nuts, bolts and other small parts for convenience in assembling machinery or in carrying small stocks in the shop.

Removing Rust from Polished Steel and Iron.

In the journal of the United States Artillery directions are given for caring for ordnance, and the treatment recommended for rust on polished steel is as follows: Cyanide of potash is most excellent for removing rust and should be made much use of. Instruments of polished steel may be cleaned as follows: First, soak, if possible, in a solution of cyanide of potassium in the proportion of one (1) ounce of cyanide to four (4) ounces of water. Allow this to act till all loose rust is removed and then polish with cyanide soap.

The cyanide soap referred to is made as follows: Potassium cyanide, precipitated chalk, white Castile soap.

Make a saturated solution of the cyanide and add chalk sufficient to make a creamy paste. Add the soap cut in fine shavings and thoroughly incorporate in a mortar. When the mixture is stiff cease to add soap. It may be well to state that potassium cyanide is a violent poison.

For removing rust from iron the following is given: Iron may be quickly and easily cleaned by dipping in or washing with nitric acid, one (1) part; muriatic acid, one (1) part; water, twelve (12) parts. After using wash with clean water.

The Reward of the Engineer.

To the earnest worker the profession of engineering gives a full reward. The youth who, steady in character and steadfast in purpose, will be persistent in his effort to learn, and unremitting in his endeavor to apply its principles, may have no fear for the success of his future. From the humblest labors of the engineer to the most exalted creations that are the results of his brain and hand, the engineering profession leads him on in his life-work,—the engineer stopping at the limits of individual capacity, but the profession always carrying him on further in aspiration. The young engineer should, besides loving his profession, dream of its glories, strive to realize its significance and grandeur, and be ever anxious to become its worthy representative. When starting out to practice his profession, the young engineer must be content to achieve success step by step rather than by leaps and bounds. He will find that wiser heads can guide his footsteps far better than he himself can direct them, and he should be susceptible to counsel from more experienced associates in his calling. With the engineer thought is supreme, and reason must be his guide. Though the young man leaves college well equipped for his life-task, sound engineering judgment is necessarily of slow growth. Youth has its special problems and duties, which are mainly those of preparation, strong faith, and buoyant action. The nation will call upon its young engineers in the heyday of their strength and vigor for work, which sober age is unable to perform. Later, for having patiently waited, and wisely used their powers, they may all the more reasonably expect to possess the philosophic mind that comes with years, and to bear gracefully the burden of wisdom. Before the young engineer are many difficulties and trials, for his life at best is not all "cakes and ale," but he will soon learn to bear his burdens and indeed to look for and stand ready to receive them—and thus attain to his manhood.—Rear-Admiral George W. Melville to the students of Stevens Institute of Technology.

Legal Notes.

BY WM. MARSTON SEABURY, LL.B.

STATUTE REQUIRING SAFEGUARDS TO MACHINES LIBERALLY CONSTRUED.

Thomas Christianson was injured while in the employ of the Northwestern Compo Board Company. His duty was to operate a large circular saw about six feet from which was a smaller saw used for a different purpose. On one occasion Christianson stooped to gather some waste in the line of his duty, and, losing his balance, fell against the smaller saw and was severely injured. He brought suit for damages against the company in the District Court of Minnesota, Hennepin County, alleging that the company had been negligent in failing to properly guard or fence the saw which caused the injury. The jury rendered a verdict for the plaintiff of $4,000 and the defendant appealed. It appeared in the evidence that it would have been practicable to have guarded the saw and prevented the accident. The

Minnesota statute provides that "All saws . . . in any factory, mill or workshop shall be so located as not to be dangerous to workmen, or shall be as far as practicable properly guarded, fenced or otherwise protected." The Appellate Court refused to disturb the verdict of the jury and in the course of its opinion said: "It was intended to protect from personal injury the workmen or employees in any shop, mill or factory, by reason of dangerous machinery therein, and it must be so construed as to give effect to such wise and humane purpose. Therefore the statute must be and is construed as requiring that such machinery must be so guarded if practicable as to protect such workmen, whether actually operating the machinery or engaged in the discharge of any of their duties in the factory, mill or shop where it is located, from liability to injury by it. If the person charged with the duty of guarding such machinery omits to do so he is chargeable with negligence and liable to any workman or employee injured thereby, although he could not have reasonably anticipated injury in the precise way it actually occurred." (85 N. W. R. 826.)

The Philadelphia.

The American Line steamer "Philadelphia," formerly the "Paris," will come out with quadruple expansion engines constructed on the Yarrow, Tweedy and Schlick system, and developing considerably greater power than her former triple expansion equipment. In these engines the high-pressure cylinder is placed close to the low-pressure cylinder. Piston valves are used throughout except for the low-pressure cylinder which has two slide valves on opposite sides of it. These valves are double ported. Forged steel is used on all the working parts, the front frame is of the usual cast-iron forked column type, square supports being used at the back and separate condensers.

Technical Publications.

"Theoretical Elements of Electrical Engineering." By Chas. P. Steinmetz, 327 6x9-inch pages with 143 illustrations. "The Electrical World and Engineer." Price, $2.50.

This book is in a measure supplementary to the author's "Theory and Calculation of Alternating Current Phenomena" and is of the high character to be expected of its distinguished author. It is highly mathematical and can be read by those only who are well versed in both electricity and mathematics.

"The Textile World's Official Directory of the Textile Industries for 1901." 454 6x9-inch pages. Guild & Lord, Boston. Price of travelers' edition, $2; of office edition, $2.50.

This year's directory of the textile and allied industries is a very complete and satisfactory volume. It is believed to contain all the textile establishments of the United States, and it certainly forms an impressive exhibit of the magnitude of these industries. It also contains lists of agents and buyers of fabrics, of dealers in raw material and stock, of yarn manufacturers, dealers and agents, of commission and order mills and of dyeing and finishing establishments, etc. The book will be found of great value to all who have dealings with textile establishments, including manufacturers of textile machinery.

A series of carefully conducted experiments with the German infantry rifle shows that the highest velocity of the projectile is not at the muzzle but some distance in front of it. A mean of ten shots showed a muzzle velocity of 630.6 meters (2,068 feet) per second, while the maximum velocity, 650.2 meters (2,132 feet) per second, was attained at a distance of 3 meters (10 feet) from the muzzle.

Mr. Joseph E. Bissell, of Pittsburgh, Pa., has devised a noiseless cartridge for guns. He interposes between the powder charge and the bullet a trunk piston and a considerable quantity of machinery oil, the result being that while penetration and other effects remain about the same, the noise of discharge is, strange to say, entirely done away with, and it is claimed that while the same results as from ordinary cartridges are obtained, the noise made by the discharge cannot be heard at a distance of 5 feet from the gun.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant ; see p. 22.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Shafting straighteners. J.H.Wells,Tampa,Fla.

Wanted—Improvements in grinding machinery. Address Box 1435, Providence, R. I.

Light and fine mach'y to order ; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

Wanted—One good second-hand turning & boring machine. Address A. B. C., care A. M.

"Brandt's Triple Expansion Gaskets" are the best for boilers. Randolph Brandt, 38 Cortlandt st., New York.

See 12 presses & dies for sheet-metals, S. E. cor. Machinery Hall, Buffalo Exposition. Ferracute Mch. Co., Bridgeton, N. J.

Machinery built by contract ; modern equipment and organization ; accurate work ; prompt delivery ; low prices ; weights up to 5 tons. The Blanchard Machine Co., Boston.

Gear and Milling cutters, adjustable reamers and special tools ; vertical millers, cutter and surface grinder and shears. Catalog of small tools free. R. M. Clough, Tolland, Conn.

Technical graduate in mechanical engineering, 14 years' experience as superintendent, wishes to join some good party in the manufacture of a selling article ; have capital. Address Box 369, AMER. MACHINIST.

Purchaser for small manufacturing plant ; lot, 100x180 feet ; machine shop, 32x68, two story, with line shaft and gasoline power ; foundry, 40x54, new modern equipment ; good location ; for sale cheap. Hart-Parr Co., Madison, Wis.

Two hand-colored tempering charts (A and B), 36 steel-working receipts and free sample of Monarch Welding Compound, all for $1 ; these cover all difficult steel working ; invaluable to machinists. W. M. Toy, Sidney, Ohio (40 years a steel worker).

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisement under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Mechanical draftsman wishes position. Address Box 382, AMERICAN MACHINIST.

All-around machinist wants steady position out of New York. H. Weller, 503 5th ave., New York.

By a young man, first-class vise, milling and gear cutting hand ; 10 years' experience ; have had charge of milling department. Box 379, AMERICAN MACHINIST.

Machinist foreman, up to date, technically educated, energetic, can organize and handle men to best advantage, experienced in labor-saving devices, desires suitable position. Box 376, AMERICAN MACHINIST.

Designing draftsman, 17 years' experience on marine and stationary engines, general and special machinery with leading firms, is open to engagement September 1 ; New York or vicinity preferred. Address Box 377, AM. M.

Management or superintendency of machine works wanted by a practical man, thoroughly versed in cost reduction ; from past experience can give a fair idea of saving to be effected upon investigating plant. Address Box 362, AMERICAN MACHINIST.

Position as foreman of tool or model department or small shop, by first-class toolmaker on jigs, fixtures, gages, etc ; model precision and watch-tool work ; gave satisfaction and can refer to best shops in the country ; age 27 ; fair technical education ; present location, Providence, R. I. ; will go anywhere. Box 375, AMERICAN MACHINIST.

Position wanted with an old-established or growing concern, manufacturing stamped or pieced sheet metal goods or specialties, as superintendent or foreman, where results will be recognized ; A1 designer of every description of dies, tools and special machines ; handling men, etc. ; 14 years' experience. Address Box 368, AMERICAN MACHINIST.

Help Wanted.

Wanted—First-class patternmakers at the Reeves Machine Co., Trenton, N. J.

Wanted—Experienced toolmakers ; no labor trouble. Address Bullock Electric Mfg. Co., Cincinnati.

Wanted—Experienced men for responsible positions. Address James Brady, 220 Broadway, New York.

Wanted—First-class machinists. U. S. Long Distance Automobile Co., 307 Whiton st., Jersey City, N. J.

Wanted—Machinists ; first-class lathe and floor hands ; steady work ; good pay. Address Box 153, Detroit, Mich.

Foreman wanted for up-to-date machine shop, employing about 60 men. Address S. Modern, care AMERICAN MACHINIST.

Wanted—A mechanical draftsman of at least 5 years' experience ; location within 20 miles of New York. Box 386, AMER. MACH.

Wanted—Machinists ; two floor hands, one good boring and turning mill man. Address Northern Engineering Works, Detroit, Mich.

Wanted—First-class metal patternmakers and machinists ; state experience and references. Address Box 373, AMER. MACHINIST.

Wanted—Two first-class machinists to work in job shop ; steady work at good wages. Fairmont Coal Co., Fairmont, W. Va.

Wanted—Brass foundry foreman, experienced on valves and fittings ; state age, if

(*Continued on next page.*)

In No. 30 the head-line writer made a mistake with Mr. F. C. Fladd's article. Of course Mr. Fladd did not mean to say nor does he say that the die there described is "the first cutting and drawing die," but only that he had made the first one on the system described.

Personal.

Professor J. S. Coon, superintendent of the shops of the Georgia School of Technology, Atlanta, Ga., was presented recently with a gold-headed cane by the senior class of that institution. The matter had been so quietly managed that the presentation was a complete surprise.

Obituary.

Col. Wm. E. Barrows, a mechanical engineer, who was president of the Welsbach Light Company and served with distinction during the Civil War, died at Haverford, Pa., recently. He was born in Hudson, Ohio, in 1842, and was educated at Phillips Andover Academy.

New Corporations.

Nepperham Machine Co., of Yonkers, N. Y. Directors: T. F. Curran, J. S. Gledhill and D. C. Nolan, of Yonkers.

New Era Machinery Co.; principal office, 1 Exchange place, Jersey City, N. J.; object, manufacturing machinery; capital, $200,000. Incorporators: George F. Bradstreet, Herbert L. Keys, Richard M. Farries.

Lombard Governor Co.; principal office, the Corporation Trust Co. Building, Jersey City, N. J.; object, manufacturing machinery; capital, $500,000. Incorporators: Joseph Bennett, Homer Loring, K. K. McLaren.

Premier Manufacturing Co.; principal office, 1421 Atlantic avenue, Atlantic City, N. J.; object, manufacturing tools; capital, $10,000. Incorporators: Rodman Corson, Luther Corson, John H. Applegate.

Pierce Motor Vehicle Co.; principal office, East Bound Brook, N. J.; object, manufacturing automobiles; capital, $40,000. Incorporators: Ray V. Pierce, V. Mott Pierce, Hugh C. Pierce, Elmer S. Smith, Wm. K. Bassford, Jr.

M. & C. Name Plate Machine Co.; principal office, 1007 Grand street, Hoboken, N. J.; object, manufacturing machinery for name plates; capital, $4,000. Incorporators: Frank J. Marion, Harry N. Marvin, Wallace McCutcheon.

The United States Power Co.; principal office, the Corporation Trust Co. Building, Jersey City, N. J.; object, manufacturing engines, etc.; capital, $250,000. Incorporators: J. Wesley Allison, Kenneth K. McLaren and William Milnes Maloy.

Nathans Electrical Manufacturing Co.; principal office, 235 Grove street, Jersey City, N. J.; object, manufacturing electrical machinery; capital, $125,000. Incorporators: Thos. A. Nathans, John A. Nathans, Frank L. Zabriskie, Edwin C. Ranney.

United Supply Co.; principal office, New Jersey Registration & Trust Co. Building, 525 Main street, East Orange, N. J.; object, manufacturing railway supplies; capital, $20,000. Incorporators: Alfred G. Brown, Edward B. Hawkins, Albert R. Palmer.

The Imperial Manufacturing Company, of St. Paul, Minn., to manufacture electrical devices and steam-heating apparatus. M. D.

(*Continued on next page.*)

Help Wanted—Continued.

now employed and wages expected. Box 356, AMERICAN MACHINIST.

Machinists wanted at San Francisco; wages $3.50 per day; bonus of 50c. additional per day for one year of satisfactory service. Box 370, AMERICAN MACHINIST.

Good patternmakers, both wood and metal, desiring steady employment, will find it to their advantage to apply to the General Electric Co., Schenectady, N. Y.

Wanted—Iron and brass foundry foremen; capable of handling men to advantage; understands molding machines and mixing metal. Address Box 372, AMERICAN MACHINIST.

Wanted—Good machinists to work in open shop at Detroit, Mich.; permanent employment and good pay for competent and steady men. Address R., care AMER. MACHINIST.

Wanted—Mechanical draftsman; one who has had experience on electrical machinery and tool work preferred; state experience and name of last employer. Box 339, AM. MACH.

Wanted—Working foreman for turret department, to take charge of 10 turret and screw machines; state experience, wages expected and references. Box 340, AM. MACH.

We invite applications from machinists and molders; give references, experience and wages expected; work on air compressors. Franklin Air Compressor Co., Franklin, Pa.

A large New York factory requires the services of a few mechanical draftsmen for intricate work; state age, experience and salary; permanent positions. Box 381, AM. M.

Wanted—Machinist or patternmaker in every shop or manufacturing locality, as agent; good opportunity for bright man to add to his regular salary. Address W., Box 391, Indianapolis, Ind.

Machinists.—Two or three good, all-round machinists for shop building slide valve engines; location Western Pennsylvania. Address, stating age and experience, Box 357, AMERICAN MACHINIST.

Wanted—Draftsmen experienced in structural and mechanical work; good salaries and permanent position to the right men; give record, stating experience and salary expected. Box 347, AMERICAN MACHINIST.

Blacksmiths.—Two good general machine blacksmiths for machine shop near Pittsburgh, Pa.; good wages and steady work will be given to competent men. Address, stating age and experience, Box 358, AMER. MACHINIST.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—An experienced manager and mechanical engineer accustomed to up-to-date methods for producing small and medium machine work of best quality and cheaply; salary and best of references required. Address Box 346, AMERICAN MACHINIST.

Wanted—Estimater and designer; must be fairly well up in sheet metal work, principally brass; must be able to design tools and make his own drawings; to an able and wide-awake man a permanent position can be assured. Address, giving particulars, Box 371, AM. M.

Wanted—Iron foundry foreman; one familiar with iron valves and fittings; must understand molding machinery, and capable of handling men to best advantage; foundry employing about 25 bench, 15 floor and 25 machine molders. Address Box 359, AM. MACH.

Wanted—A competent manager, to take complete charge of a large iron foundry equipped with power cranes in a Pennsylvania town; an interest in the business would be set aside for a proper man; must have good business and mechanical training. Address Box 341, AMERICAN MACHINIST.

Wanted—Competent salesman in gas and gasoline engine and steam pump lines; must be energetic; resourceful and of good character and habits; give full information in regard to previous employment and salary expected; permanent position, with good opportunities, for the right man. Box 303, AM. M.

Wanted—Experienced machinists accustomed to accurate, first-class work; others need not apply; the work is making jigs, fixtures, etc.; good shop; modern methods; good wages to competent, progressive men. Address, stating age, experience, reference and wages expected, Leland & Faulconer Mfg. Co., Detroit, Mich.

Wanted—Assistant superintendent as general foreman for machine shop near New York employing 100 men, doing good work of medium weight; must be up in modern practice and know how to produce work at minimum cost; state age, experience in full, references, salary expected. Address Box 380, AMERICAN MACHINIST.

We are building an entire new works which will be completed about September 15, and invite applications from machinists, toolmakers, draftsmen, department foremen, patternmakers, blacksmiths, etc., on air compressors; only experienced, strictly temperate, free men need apply; permanent positions and good wages guaranteed. Gray & Blaisdell, Bradford, Pa.

A practical and experienced superintendent to take full charge of a plant employing about 80 hands; must be experienced in the construction of mechanical clockworks and be able to design special tools and direct their manufacture; a good chance for an energetic man; applications stating age, experience, references and salary expected, will be treated strictly confidential. Address Box 378, A. M.

Wanted—Superintendent for machine shop employing from 50 to 60 men on fine duplicate work; a married man between 35 and 40 preferred who has had experience on duplicate work, such as lathe, drill chucks, etc., and is fully competent to systematize work and handle men to best advantage; give past experience, references and salary expected, also state if employed at present, and when available; all correspondence held in confidence. Address Box 331, AMER. MACHINIST.

Wanted—An experienced draftsman, designer and foreman, to take an interest and position in a machine shop in a thriving Western city of 300,000 population; business well established, doing a general repair and jobbing business in boilers, engines, pumps, new and second hand; dealers in pipe, valves, fittings and engineers' supplies, and steam heating, contracting and the erection of power plants; party can invest $5,000 and upwards. Address Box 374, AMERICAN MACHINIST, giving references and particulars.

HELP WANTED

IN PARIS, FRANCE.

for a large machine shop (steam engines, pumps, dynamos, etc.) whose tools and methods are to be renewed according to the latest and best American practice.

1st. As "Chief Tool Foreman, or Manager of Tools and Appliances"—

A thoroughly up-to-date, progressive, systematic and live man; experienced on high-grade, heavy and light, labor-saving tools; practical toolmaker and all-round skilled mechanic, familiar with the designing of all kinds of devices, jigs, fixtures, etc., for cheapening production; able to take charge of all tools and machine tools in the shop, to keep them working to the best advantage and up to full capacity; with first-class products; competent to indicate in the drawing-room the most economical forms of pieces, and in the shop the most appropriate tools and methods for working them, also to make estimates of "elementary rate fixing" or of "time-limits" for the various pieces.

He must "understand" the handling of skilled and unskilled labor, and, if possible, a man speaking a little French preferred; but he will have nothing to do directly with the workmen in the shop but only with those in the toolroom, and with the higher staff in the office, in the drawing-room or in the shop.

None but a first-class man, with best references, testimonials and recommendations from high-grade concerns, need apply. No union man.

State age, nationality, languages spoken, fully past experience and salary expected, and whether married or single. Permanent situation to the right man. Address Box 383, AMERICAN MACHINIST, New York and London.

2d. As "Assistant Tool-Maker" to the Chief Tool Foreman—

A young, energetic, practical, wide-awake and skilled mechanic, with the same general character and aptitudes as above mentioned, specially as assistant in the shop and toolroom, for keeping small tools and machine tools in order, making these machines do all they were designed to do, handling directly 10 to 20 men in the toolroom, and training the skilled and unskilled workmen with new tools and time-limits, till these can be committed to the "general foreman"; should be able to tell a man how to do everything, and to do it himself if the man cannot. Permanent situation to the right man. No union man. Address as above, Box 384, AMERICAN MACHINIST, New York and London.

3d. As "Assistant Draftsman" to the Chief Tool Foreman—

A young man having had experience in the designing of tools, jigs, fixtures, etc.; practical machinist and good draftsman; familiar with the most economical forms of pieces in engines and dynamos, adapted to up-to-date tools and methods of working; specially as assistant in the drawing-room. Permanent situation to the right man. No union man. Address as above, Box 385, AMERICAN MACHINIST, New York and London.